

SCIENTISTS OF THE AIR

POPULAR MECHANICS

MAGAZINE



WRITTEN SO YOU CAN UNDERSTAND IT

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SEE PAGE 79

"If you want my number—"

Get Yourself a Barbasol Face"

It does not take many weeks to get a full-fledged Barbasol Face and then you're a prize package for the women folk.

Your jowls and cheeks look and feel softer and firmer and fresher. Roughness and irritations tend to vanish. Even wrinkles seem to smooth away.

The whole effect, of course, is a more attractive, younger-looking Barbasol Face—gained in a very short time after you discard old shaving methods and switch to modern Barbasol.

That's because Barbasol is a cream. It contains none of those harsh alkalis that dry and tighten the skin, resulting in roughness and wrinkles.



First time you shave with Barbasol, you can tell by the way it cools and soothes how wonderful it is for the skin. Its good ingredients hasten the work of your razor, and then they leave your face soft and supple and youthful looking.

Start with Barbasol today for the finest shave you ever had, and in about two weeks you'll cheer at the wonderful improvement in your face. At all drug stores, large tube, 25¢; giant size, 50¢; family jar, 75¢. Five Barbasol Blades, 15¢.

For modern shaving



No Brush—No Lather—No Rub in

How Movies of Noise Gave Cars a "Hushed" Ride

REMEMBER the clatter of old-time "gas-buggies"? In today's Plymouth you can hear a watch tick! And it's priced with the lowest...with the Commercial Credit Company's easy terms offered by Dodge, De Soto and Chrysler dealers.



1 This is One Way to plug out noise. But Plymouth contains special insulating materials which effectively keep noise out...give a "hushed" ride!



2 Different Parts of a Car have different vibrations. So Plymouth engineers put microphones everywhere inside...to ferret out the slightest noise.



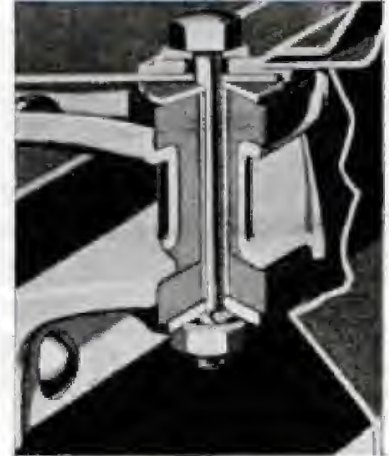
3 They Used Television tubes to photograph noise and transform it into light-rays. Throw these light-rays on a movie-film — and noise will paint its own picture for you.



4 This is a Movie of Noise. Look at the wavering sound-track on the film. Plymouth engineers studied hundreds of these "movies." They worked out 5 different ways to stop noise.



5 Dampens Hum, Rumble. When you grab an alarm-clock bell, the vibration is "dampened." A special material dampens vibration in various Plymouth parts.



6 Blocking Road Vibration. Spools of rubber "float" Plymouth's body on the frame...efficiently block out road vibration.



7 Soaking Up Noise from the Air. Insulating materials are tested in this tunnel. Noise must be actually "soaked up" by these materials.



8 Patented Floating Power engine mountings keep power vibration from being telegraphed through the car's frame to the body.



9 The Big 1938 Plymouth! See it today — and learn the whole great story! PLYMOUTH DIVISION OF CHRYSLER CORPORATION, Detroit, Michigan.
Major Bowes' Amateur Hour, C.B.S. Network, Thurs., 9-10 p.m., E.S.T.

IT'S "THE CAR THAT STANDS UP BEST!"

Plymouth Builds Great Cars

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Bread, Butter, and Jam for 13,000,000 People

ARE you one of these 13,000,000 people? Does the income which supports you come from making or selling automobiles, radios, electric refrigerators, or movie films? If so, you are one of them. You are one if that income comes from the rayon or aluminum industry, or any of the other industries which have grown up in a single generation.

Automobiles, radios, gasoline, aluminum—these and many other products exist today because industry sought new products and better ways of building old ones. And after unearthing these new products, industry developed them, found

ways to build them better, means to sell them at lower prices.

Today, these industries not only employ millions but—through demands for steel, coal, cotton, transportation—they help support millions more.

Some of the greatest advances in this work have been made through the use of electricity. Through it new products have been developed, and the efficiency of all industries has been increased. In most of these modern electrical developments, General Electric research and engineering have pioneered.

G-E research has saved the public from ten to one hundred dollars for every dollar it has earned for General Electric

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Popular Mechanics Magazine

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

January, 1938

Vol. 69, No. 1

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The Rough Road to Glory

THE road to fame and fortune can be covered quickest in a racing car—that's the conviction of hundreds of enthusiastic young men today. Wherever there's an old car on which to tinker, you'll find one of them at work. One and all, they dream of roaring to glory on the race track. And some of them will! Among these ambitious young men are the winners of future Indianapolis and Roosevelt Raceway speed classics. But for each one who makes the grade, many will fail. Racing is a truly great sport but, unfortunately, there is no royal road to a speed king's crown. It's a hard, tough climb from the bottom up. After reading Major George H. Robertson's article about racing cars in this issue, your appetite will be whetted for his February article telling what it takes to make a race driver. It's filled with yarns of the track by the first American driver to win a Vanderbilt Cup race.

Next Month

AIR wardens this winter are patrolling the roadless woods of Maine and the airplane is helping to protect wild life and prevent forest fires. It is being used to stock backwoods waters with game fish and to carry food to winter-starved deer and moose. Naturally, when game wardens sprout wings, it's news and the story is in the February issue.

A Toy That Grew Up

CHILDREN were amused thirty years ago by a strange spinning toy which seemingly defied the laws of gravity. The kids called it a magic top. Their scientific elders termed it a gyroscope. And because one man of vision was intrigued by the possibilities of this toy, its uncanny balancing properties are harnessed to the controls of ocean liners and airplanes. Watch for "The Toy That Grew Up" next month.

The Ice Age Riddle

IF THE average temperature of this country should drop eight or nine degrees, Chicago would be buried under half a mile of ice. So say scientists studying the last great ice age. And a future ice age is a very real possibility, an ice age which some believe might be set in motion by the heat and fire of volcanoes! And thereby hangs a tale which you'll find in the February issue.

GOT WINGS?

NOPE, JUST GOT PYROIL

Pyroil won't actually make your car fly. But it does add a thrill to automobile performance that's sensational! As one user of Pyroil says, "My engine sounds as though it is running on velvet!"

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NEW 1938 MODELS

THE SENSATIONAL



Indian JUNIOR SCOUT

F.O.B. FACTORY
\$215.
 FULLY
 EQUIPPED

THE TWIN CYLINDER MOTORCYCLE MARVEL

THE NEW 1938 INDIANS ARE READY to flash you over the open road to fun and adventure! New Indian triumphs, all of them—great motorcycles built as only Indian can build them.

Heading the parade is the new Indian Junior Scout—the greatest twin cylinder "buy" in all motorcycle-dom! It's a great machine—an engineering marvel easy to handle, easy to start, with plenty of power and pep to flash you along with the leaders. And it costs so little to run—you'll get 70 miles to the gallon easily!

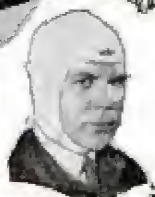
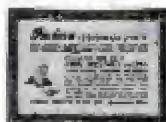
NOW OWN AN INDIAN ON EASY PAYMENTS

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36T4-CZE-L4J1

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DON'T DELAY!

Because of the unprecedented demand, dealers may not be able to accommodate you if you wait 'til the last minute. So see your dealer for demonstration *today*.

\$9⁹⁵

AMERICA'S No. 1
MOVIE CAMERA!

CINE "8"
UniveX

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Are You STILL in the DEPRESSION??

TIMES are better. Business is out of the rut—well ahead of a year ago. Millions of men have gone back to work. There's more money in lots of pay envelopes. But what good is that to you, if your pay check is still written in depression figures?

You weren't so discontented a year ago. In fact, you considered yourself lucky to have a job. But now—you have begun to wonder and worry why the oncoming tide of prosperity hasn't reached you yet. The situation is getting desperate. Bills continue to pile up. You can't get along forever on a "shoe string" budget. You *must* win back those pay cuts. Other men are doing it—how can you?

Certainly, you can't work any harder than you have been. And it isn't a question of your intelligence, honesty or ambition. Those virtues do not solve today's problem—they are often insufficient to hold down a job, as millions unemployed sadly testify.

But there *is* a way to get back to the prosperity pay check. A way that's probably far easier than you have dreamed. A *plan* that has been "depression-tested."

During the worst period of the depression, this plan was helping thousands of men and women forge ahead. Today, during recovery, these same men and women—their ranks swelled by thousands more—are being picked for top positions. They are escaping years of monotonous, routine service—achieving their dreams while they are young enough to enjoy success in its fullest measure.

Since this plan brings results in bad times as well as



good, it obviously works independently of business conditions. As unbelievable as that may sound, remember that success is largely up to the individual. Most men struggle through a depression all their lives. The few who forge ahead ride to success the same business tides that sweep the majority to failure.

The LaSalle Success-Building Plan is made for men like you—men with courage, ambition, persistence, who need expert guidance to make the most of their efforts. But LaSalle supplies even *more* than that. Not only individualized training and coaching to help you meet today's crying needs . . . but also the very steps you need to take to fill the job ahead, and force that pay raise *quickly*. Any synopsis of this plan, which we might include here, could give you only a vague idea of this service. We suggest you mail the coupon for complete details on your own line of work.

Today's Danger

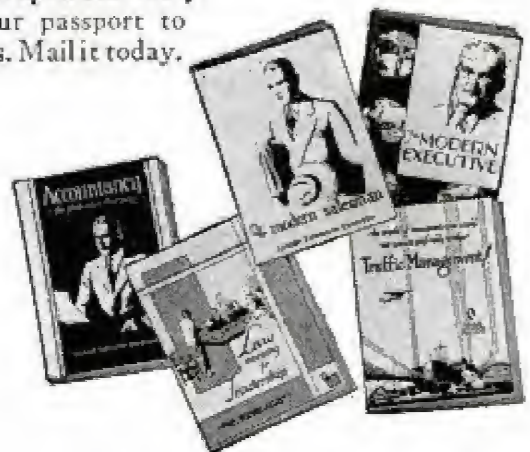
There's a real danger to accepting "depression pay" these days. A danger that lower wages will continue to dog you—for no employer will pay more until he is convinced you are worth more. Some day, some way, you've got to convince him. There's no time to lose. The sooner you begin, the better.

If the LaSalle Plan has fulfilled this aim for thousands, isn't it logical to expect it can do as much for you? This coupon can easily become your passport to better times. Mail it today.

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THE OLD WAY You bought a file like your wife buys a hat . . . the clerk hunted through five or ten boxes, unwrapped yards of brown paper . . . and wondered whether you actually knew what you wanted . . . it took lots of time and patience . . .



THE NEW WAY You step up to a self-service display, find popular types and sizes clearly divided, marked, and priced . . . cellophane wrapping lets you examine each file closely and quickly choose the one you want at the price you want to pay.

• • •

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IMPORTANT NOTICE

It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. We take no responsibility as to whether the disclosures contained in our articles are covered by patents and advise readers to investigate this subject before making, using, or selling any of the products, machines, or processes described, in order to avoid possible liability for patent infringement.

A-FILE FOR EVERY PURPOSE

**What will you
be doing - ONE
YEAR FROM TODAY**



THREE hundred and sixty-five days from now — what?

Will you still be struggling along in the same old job at the same old salary — worried about the future — never able to make both ends meet?

One year from today will you still be putting off your start toward success — thrilled with ambition one moment and then cold the next — delaying, waiting, fiddling away the precious hours that will never come again?

Don't do it, man — don't do it.

There is no greater tragedy in the world than that of a man who stays in the rut all his life, when with just a little effort he could advance.

Make up your mind today that you're going to train yourself to do some one thing well. Choose the work you like best in the list below, mark an X beside it, and, without cost or obligation, at least get the full story of what the I. C. S. can do for you.

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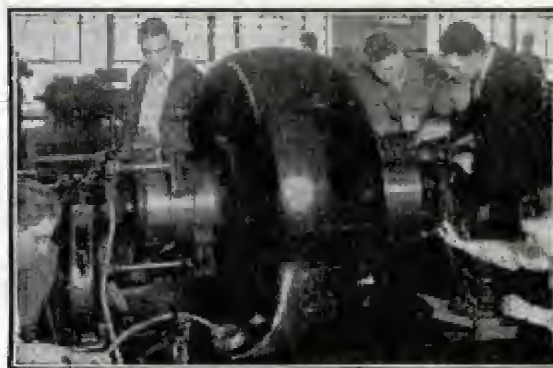
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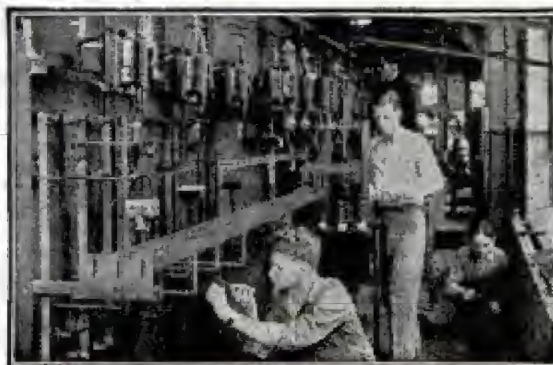
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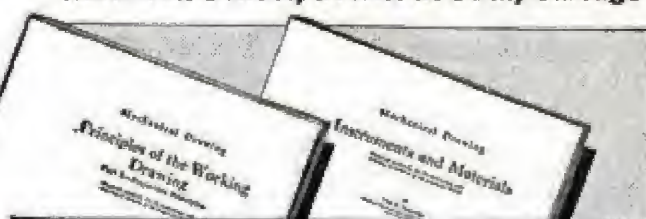
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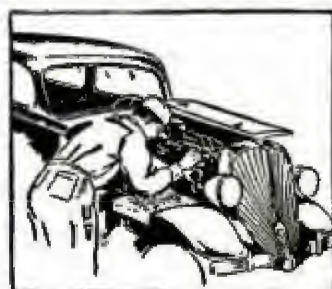
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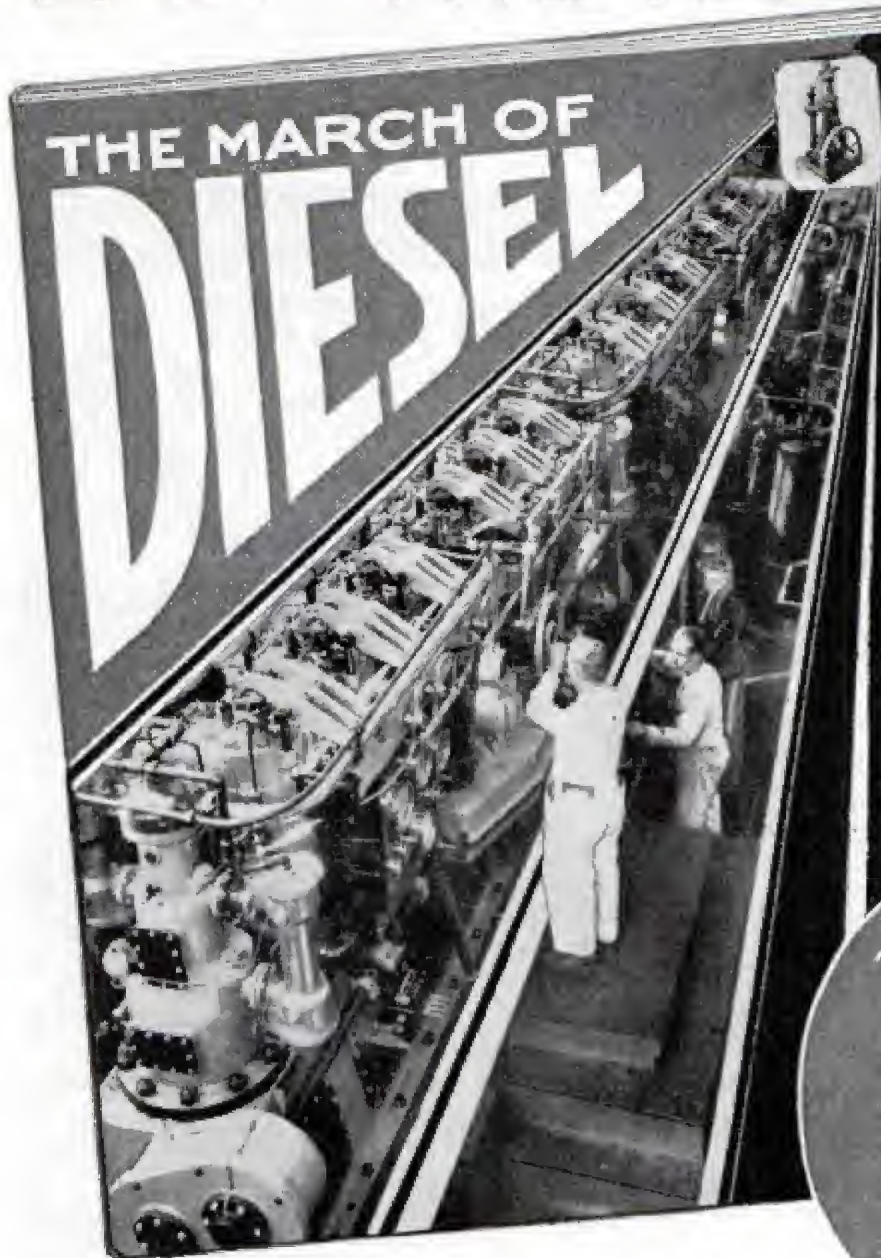


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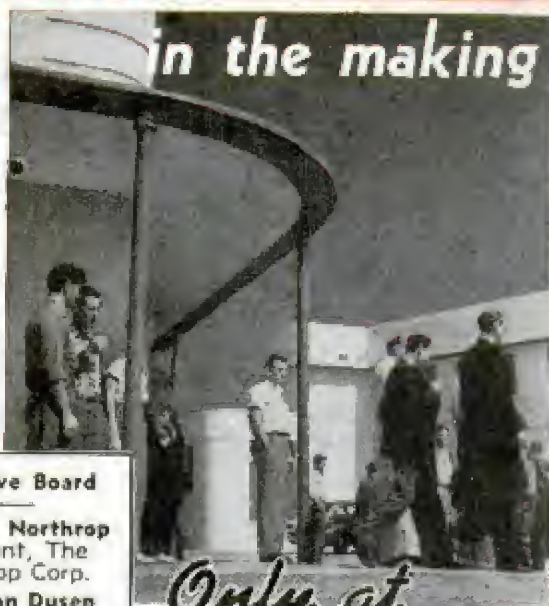
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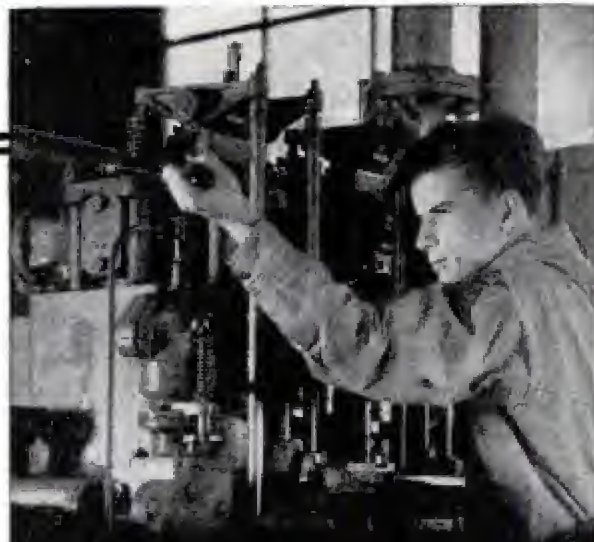
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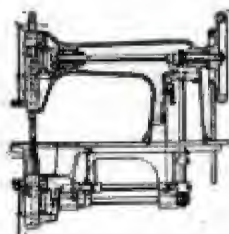
THIS is a message to inventors, for inventors, about inventors. If you yourself have an invention—even though it's only a crude idea in the back of your mind—**READ ON.** Read what other inventors have done—what steps they took—what steps you can take.

First remember this: that to be practical, useful, salable, and profitable, neither an invention nor the inventor need become famous. Most inventions and inventors are not. You know that Morse invented the telegraph; Edison the electric light; Bell the telephone. But who invented the eyelets in your shoes, the tips on the laces, the hook where you hang your coat, the hundreds of things you use from early

morning until you go to bed at night?

In fact, the benefits you derive from the inventor do not even stop at night. You brush your teeth with a patented brush; with paste or powder from a patented tube or container; you wash in a patented basin; bathe in a patented tub; go to bed on a patented mattress, which in turn rests on patented springs.

Yet there is—always will be—room for improvement, progress, **INVENTION.** And for more **INVENTORS!** Today's "pipe dream" may become tomorrow's necessity. Most of the things people used even five years ago have been changed, improved, by new inventions. That is because inventors have been busy. Maybe it will pay you to get busy, too. Who can tell?



Double Stitch Sewing Machine

The Double Stitch Sewing Machine shown in diagram form at the left, is one of the patented inventions of Miss Beulah Louise Henry, famous as the leading woman inventor and generally known as "Lady Edison." With more than fifty patents to her credit, "Lady Edison" is still going ahead. The Double Stitch

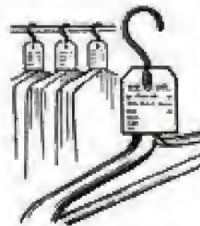
Sewing Machine shown here eliminates the bobbin, practically doubles speed of the average machine, permits use of smaller thread, and is less expensive to manufacture. Among her other inventions are a hair curler, vanity case, rubber sponge soap holder, dolls, toys and typewriter attachment.



Shaving Cream and Toothpaste Dispenser

Apparently Paul F. Roache, the inventor of this dispenser for shaving cream or toothpaste, was tired of having his shaving cream misplaced or of failing to find toothpaste ready for use at a busy moment. So he invented this dispenser to be attached to the wall of the bathroom. Patented certain features of same during 1937. The device first opens the collapsible tube and then discharges a desired

amount of paste and automatically closes the container when released. Handy, indeed, especially when you are in a hurry.



New Type Clothes Hanger

It is to be supposed that Richard D. Moore, who patented this new type clothes hanger in 1937, didn't like the ordinary wire or wooden hanger and decided to do something about it. So he developed and patented a new type hanger which can be made out of compressed paper and which also provides for an identification tag. The tag can be used for advertising purposes or for quickly locating a suit or dress of any patron in a dry cleaning establishment.



Lipstick Spreader and Remover

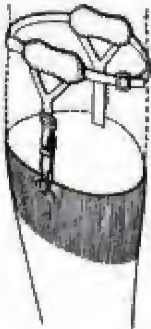
Another lady takes a hand at invention. Miss Esther M. Buttchrau patented this little device to be carried in a woman's purse. The container holds small absorbent pads, to be used in place of handkerchiefs or tissue paper, for spreading and removing lipstick. Remove lid of container, push up the little feeder or knob at the bottom and up comes a pad. Lift off pad, use it on the lips and then discard.



Illuminated Sinker

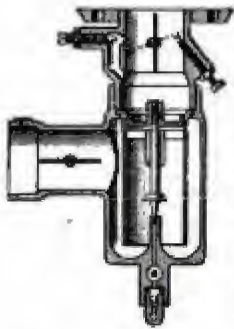
The fact that fish are attracted to light is no recent discovery. Illuminated fishing lures are not new. But James D. Watts decided he had a new and improved method of construction. The sinker contains a dry cell and small light bulb. When fish come "arunning" to the light, they're supposed to smell the bait and presto, they're hooked. There's just no telling where an inventor's mind will turn.

ABOUT INVENTORS



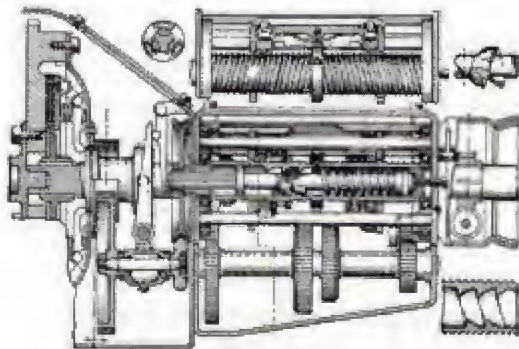
New Type Garter

Dr. Jeremiah Day, another inventor, believes in keeping his socks up evenly all around. The Y support for the garter attachment is designed to distribute pressure on the garter band evenly instead of at one or two points, thus preventing the sock from being up in front and down behind. The garter is also intended to insure greater comfort, and to prevent the possibility of interference with blood circulation. Why wear garters and then keep pulling up your socks?—so reasons this inventor.



Carbureter

Literally thousands of inventions relate to the operation of a gasoline motor. Here you see in phantom another idea for carbureter construction. The inventor's object is to provide a device to be employed either as an up-draft type or a down-draft carbureter and a means to simultaneously control the air and fuel in accordance with the increased or decreased speed of the motor. The inventor in this case is Eugene H. Rustin.



Automatic Transmission

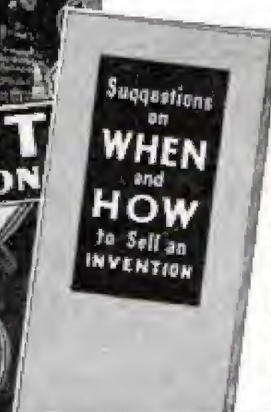
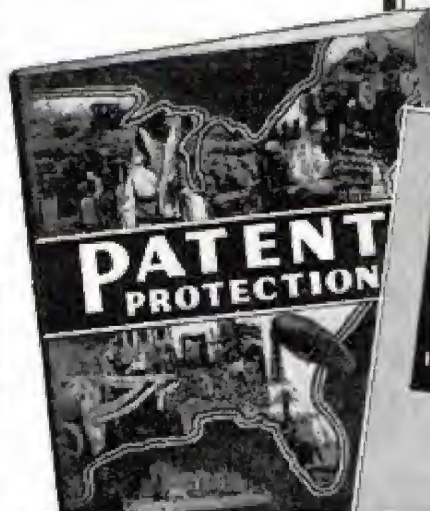
And here we illustrate what is commonly known as a complicated invention. This cross section showing the multiplicity of gears, drives, levers and shafts, serves to give only a crude idea of the mechanism involved in George L. Brown's conception of an automatic transmission. In cases of this character, the patent application frequently taxes the skill and knowledge of the patent attorney to the utmost. The cross section shown here is but one of several views embodied in the actual patent itself, granted by the Patent Office in 1937. It is said that today's automobile embodies the work of thousands of inventors. Certain it is that because of the spirit of inventive progress, the world has traveled a long way from the stage coach stage.

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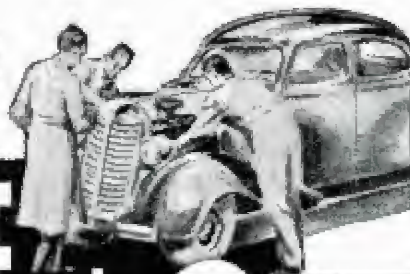
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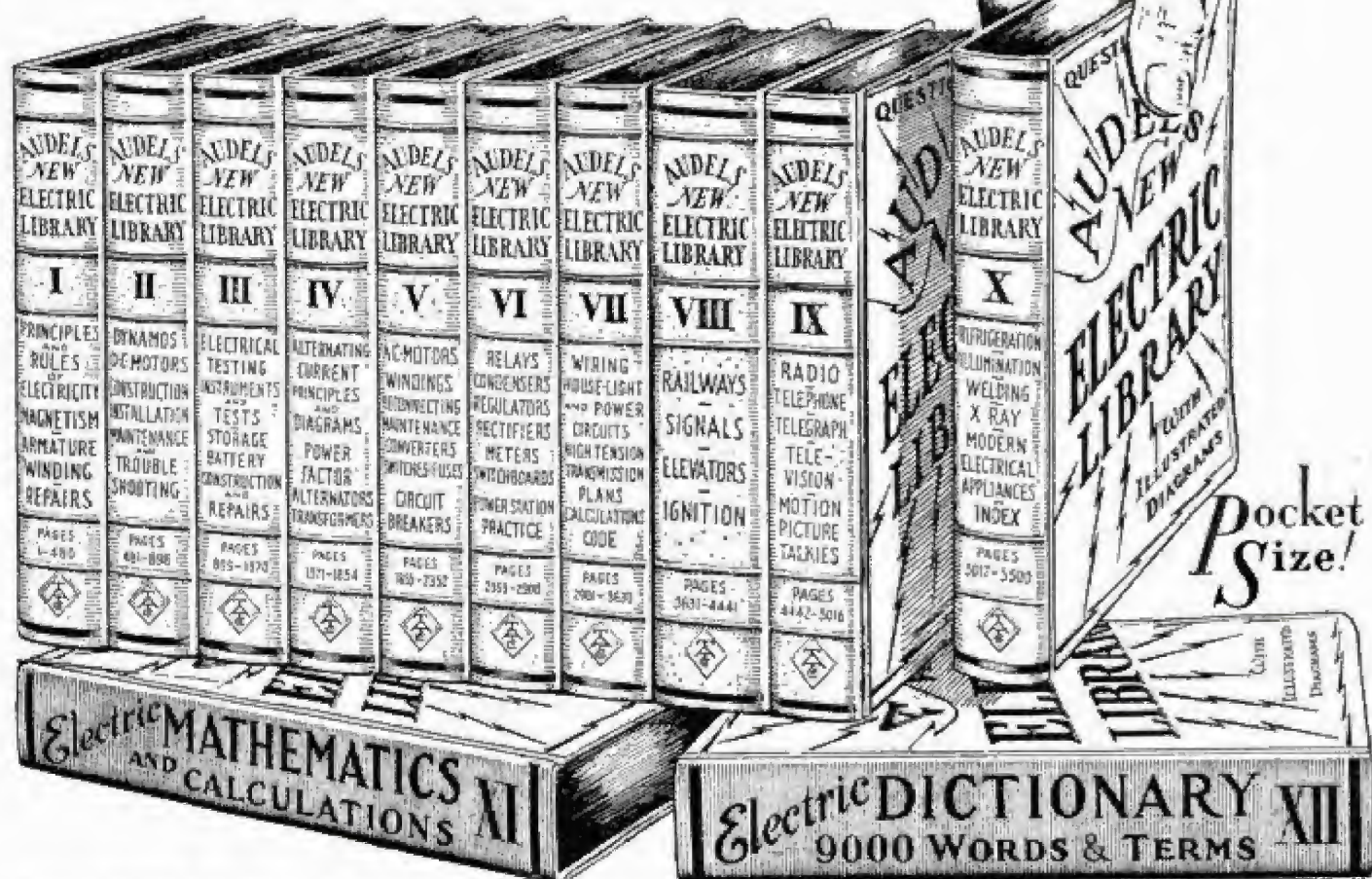
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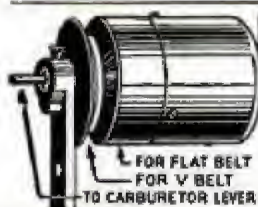
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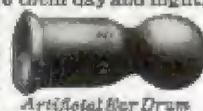
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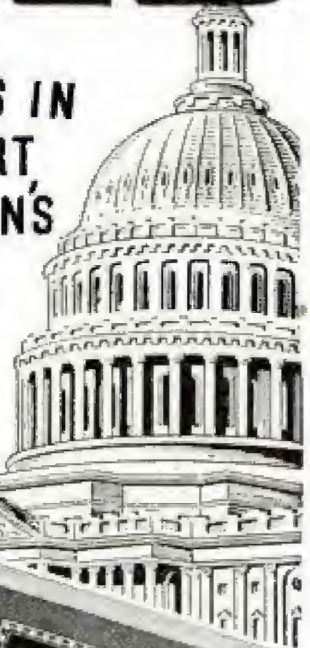
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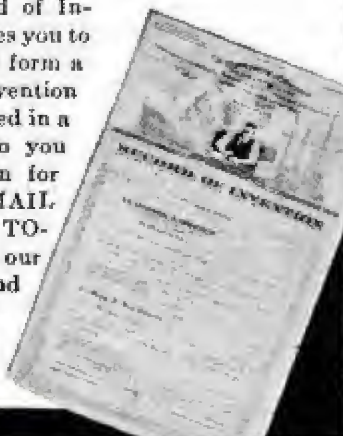


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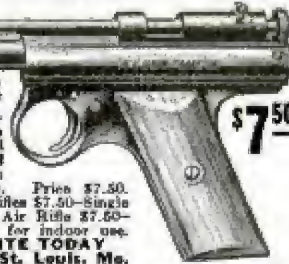
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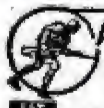


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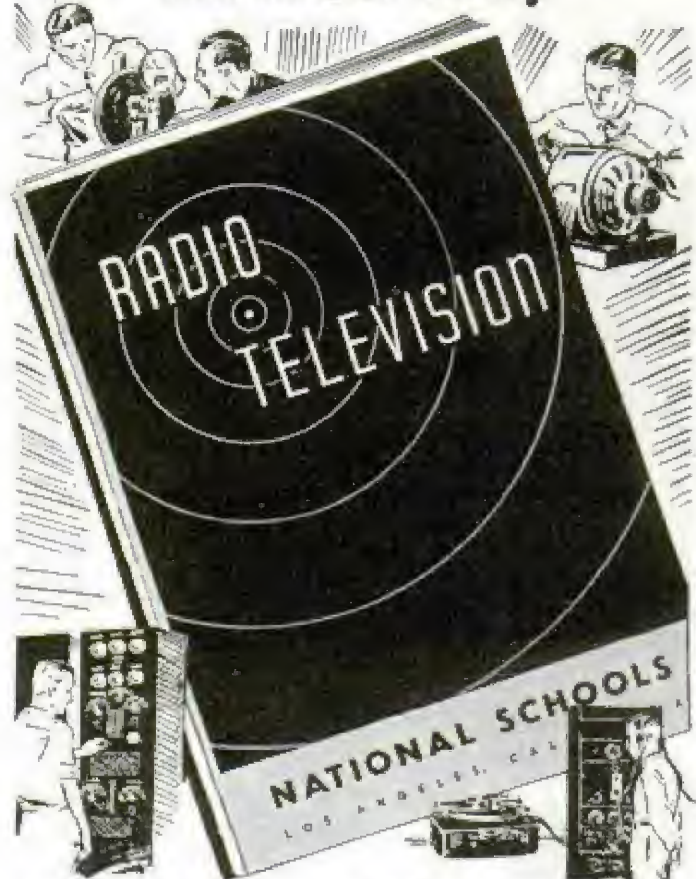
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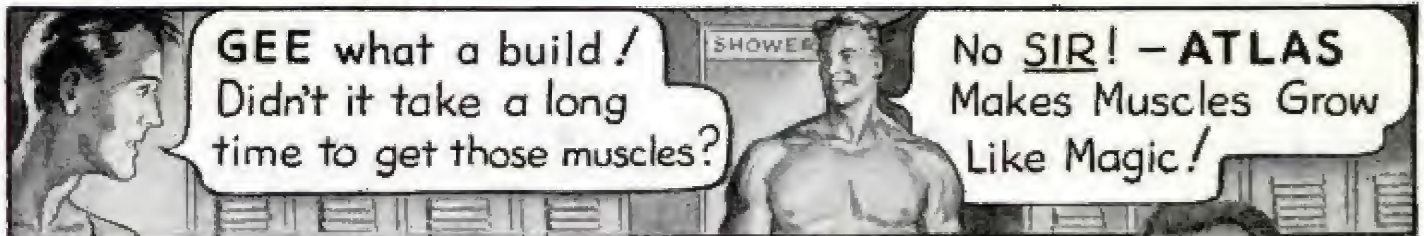
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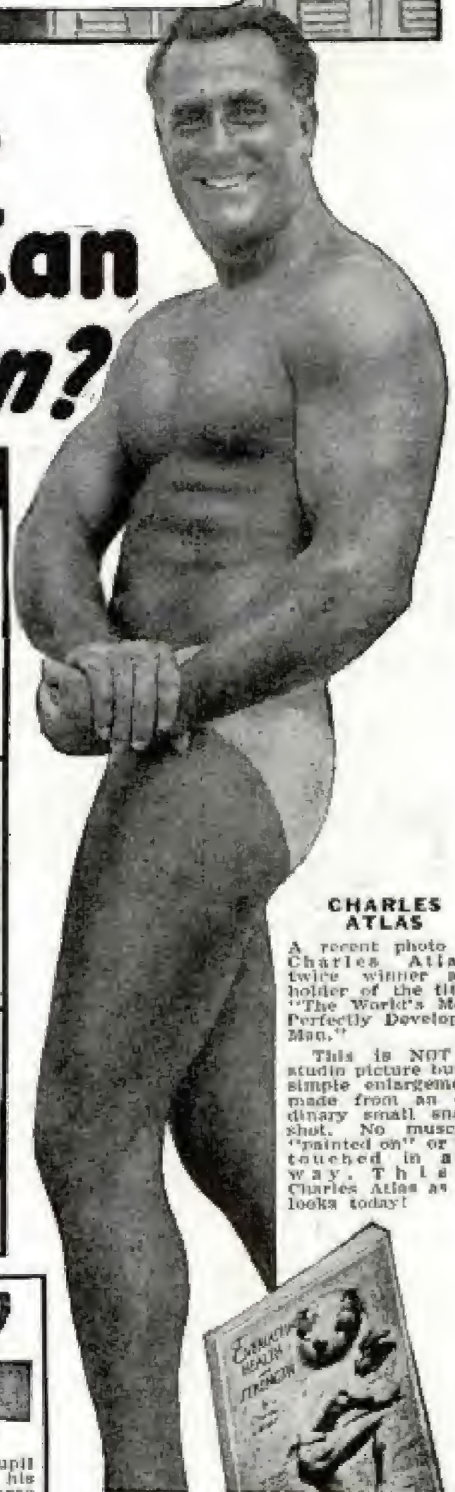
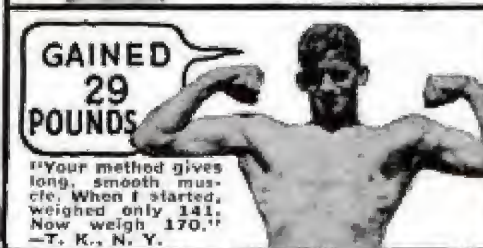
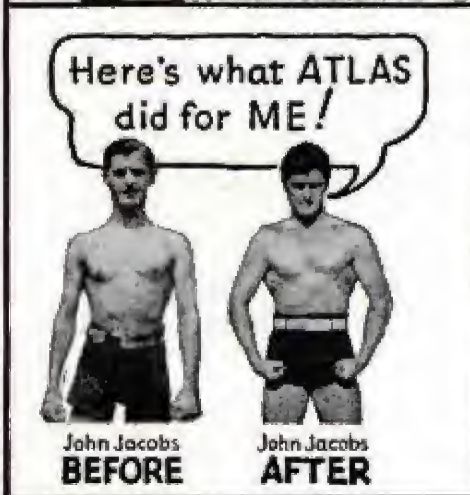
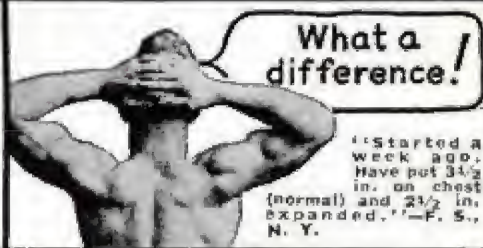
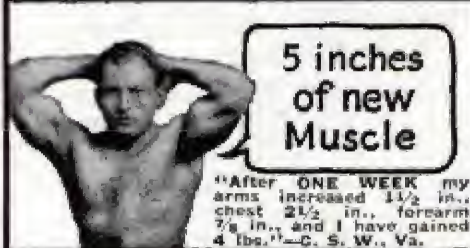
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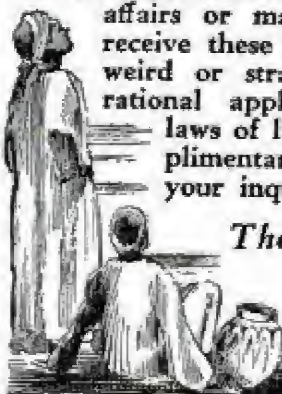
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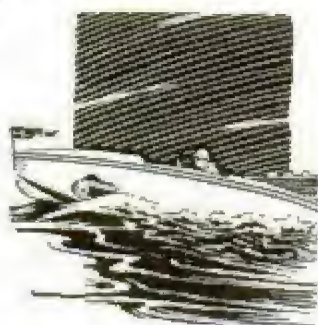
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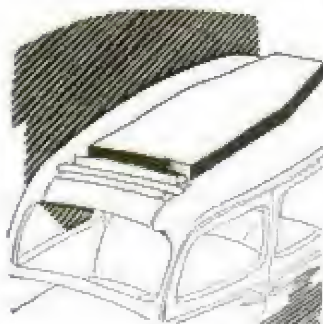
es 1141 **UNORTHODOX** propulsion of a motor-boat is provided under a patented design revealed recently. The design calls for a motor-boat with a hull having a recess. An endless propeller belt, connected to the motor, is equipped with means for expelling the water from the recess in the hull, thus giving the boat a forward motion.



WALKING on ice or wet, slippery pavement would be easy if your shoes were equipped with a non-skid attachment for which a patent has been issued. It is a flat sandal wire frame forming the outline of the sole of the foot, with wire braces running crosswise. Spikes extending downward from the braces give a firm footing. The frame is attached to the shoe by means of straps and buckles at the toe and instep.



MORE space for the traveler's clothing is provided by a patented bag which is attached to the top of the automobile. The boxlike bag conforms to the general dimensions of the top. It has narrow, collapsible side-walls and a rigid front wall. At the

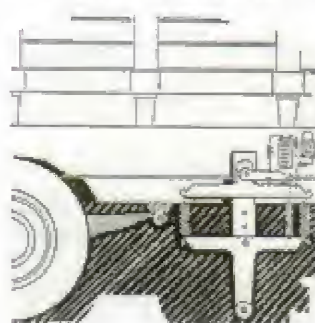


rear end is a full opening. A pulley, operated by flexible cable, controls movement of a chain inside the bag. This chain has connections or hooks for wearing apparel, such as suits and dresses. When the garments have been attached to the chain, they are pulled into the bag by means of the pulley and the opening is closed.

IMPROVED lighting is the purpose of a lamp just patented. It consists of the electric bulb and a shade supported for adjustment about the bulb axis. An opening is provided in the shade at one side. Between this opening and the bulb is a lens which collects and projects an intense beam of light in the direction determined by the adjustment of the shade frame. Thus, the light might be adjusted to cast a powerful beam on a book, table, work-bench or other point.



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(Continued to page 40A)

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Vacu-matic Carburetor Co.
7617 W. State St.
Wauwatosa, Wisconsin

Dear Sirs:

Having just completed a new speed record between Los Angeles and Chicago, driving a 1936 Chevrolet equipped with a Vacu-matic carburetor control, I thought you might be interested in knowing some of the facts and the important part Vacu-matic played in the success of the run.

The distance covered was 2322 miles in thirty nine hours and forty-two minutes, officially timed by Western Union, which gave me an average speed of 59.7 M.P.H. based on elapsed time and with the Vacu-matic averaged 18 1/2 miles per gallon on gas-line.

Before leaving Los Angeles, we made several test runs both with and without the Vacu-matic, and the tests proved that Vacu-matic increased my gas mileage 3 1/2 miles per gallon at the driving speed of 60 M.P.H. and also very noticeable increase in both acceleration and power.

After this experience with Vacu-matic, you can depend that on my future speed runs across country that I will be depending on Vacu-matic to give me the same added performance it has proven on this last record breaking drive.

Yours very truly,

Bob McKenzie



**Sets New
Coast-to-Chicago
Record**

**New Supercharge
Principle
SAVES GAS**

**MORE POWER - MORE SPEED
FASTER PICK-UP - NEW LIFE**



ESTABLISHING new mileage records on cars in all sections of the country, the Vacu-matic again scores in a new speed record established by Bob McKenzie transcontinental automobile champion. Los Angeles to Chicago—2,322 miles in 39 hours and 42 minutes—driving 75 and 80 to maintain a speed average of 59.7 miles per hour!

Here is speed—a gruelling grind—where quick acceleration, greater top speed—and less stops for gasoline mean those precious moments saved that make new speed records possible. The same Vacu-matic that helped Bob McKenzie establish this speed record and gave him such fine gas savings is now available for all car owners. It is entirely automatic—simple to install—inexpensive—and pays for itself many times over in gas savings.

Automatic - - Nothing Like It!

Vacu-matic is *entirely different*! It operates on the supercharge principle by automatically adding a charge of extra oxygen, drawn free from the outer air, into the heart of the gas mixture. It is entirely AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. It is so simple it will amaze you—so practical it will save you many dollars on gas costs.

Fits All Cars

VACU-MATIC is constructed of six parts, assembled and fused into one unit, correctly adjusted and sealed at the factory. Nothing to regulate. Easily attached in ten minutes.

Agents and Salesmen

VACU-MATIC offers a splendid opportunity for unusual sales and profits. Valuable territories now being assigned. Check and mail coupon.

The VACU-MATIC Co.

Wauwatosa, Wis.

Guaranteed Gas Savings

VACU-MATIC must prove itself on every car. It is guaranteed to give worthwhile gas savings, quicker pick-up and more power, or it costs you nothing. "On my V-8 Ford it works miracles", says Ralph Fields. James Seeley—"On an International Truck on a round trip to Cleveland, 385 miles, it saved 19 gallons of gas." A. V. Grove—"On the Buick it showed 5 miles more per gallon." F. S. Peck—"I average 22 miles per gal. on my Plymouth, an increase of 7 miles, for a saving of \$15.00 a month, or \$180.00 a year." Wm. Lyons—"Averaged 25 miles on a gal. with a Model A Ford at 40 miles per hour."

Free Details

You owe it to yourself to know all about this remarkable discovery. Mail the coupon below. Start saving gas with VACU-MATIC and enjoy a new driving thrill! There's no obligation—so get the facts now! Write today!

FREE OFFER COUPON

THE VACU-MATIC COMPANY

7617-356 W. State St., Wauwatosa, Wis.

Gentlemen: Please send me full particulars concerning the Vacu-matic and details of your Free Offer. This of course does not obligate me in any way.

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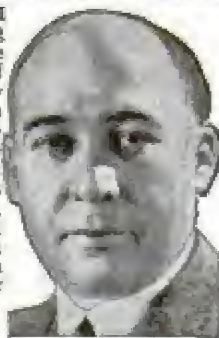
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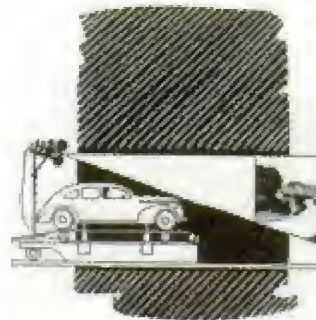
State City

NEW INVENTIONS

(Continued from page 38A)

er by means of an alarm located on the instrument panel. Thus, the driver would be able to halt the truck before complete deflation took place and save his tires.

INSTRUCTING and testing the automobile driver is made easy by apparatus

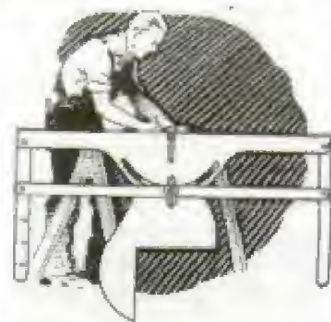


patented not long ago. It consists of a moving-picture projector with means for its operation at a predetermined speed by the driving mechanism of an automobile. Thus,

the car placed on the treadmill of the device would cause the projector to operate at a speed proportional to the speed of the car's rear wheels. The projector flashes moving pictures of traffic hazards, thus testing driver's reactions to emergencies.

FOR convenience of the carpenter is a handy tool protected by a recent patent. It consists of a parallelogram

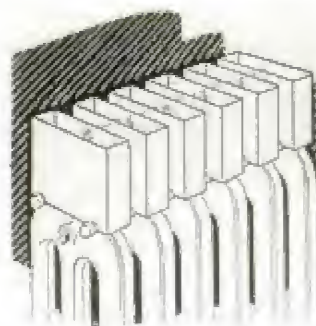
frame with pivotally connected sides and having one of the longitudinally extending sides flanged for engagement with the edge of



timber to be marked. The transversely extending sides constitute rules for marking opposite ends of the timber. A protractor is provided for setting the frame with the rules at the desired angle.

BBETTER health is the purpose of a patented humidifier which may make its

appearance soon. It consists of a series of pan units and connecting means between the pans comprising a conduit connecting the interior of the pans. A portion of the con-



(Continued to page 42A)

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GOOD MONEY
thanks to this

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Yes, this free lesson **proved** that drafting is easy, mighty interesting work . . . convinced me I didn't need special talent to get into this well-paid profession . . . **proved** beyond a doubt that Drafting by the fascinating C. T. C. method can be mastered easily **AT HOME** in SPARE TIME.

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without a penny extra. These are quality instruments—the kind that professional draftsmen use. With them you can put your ideas on paper quickly and with accuracy. With this outfit and C. T. C. training, you're all set to master draftsmanship **in months**—not years—at home, and you can use these very same instruments some day soon in a good paying job as draftsman.

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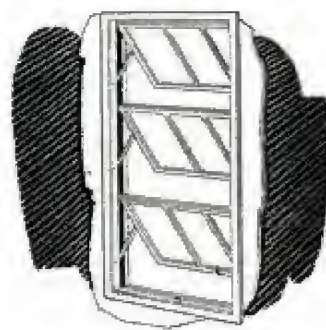
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NEW INVENTIONS

(Continued from page 40A)

duit is constructed in a lower plane than the bottom of the pans. The humidifier would be connected to the radiator by fitting the conduit over the tops of the radiator's sections.

OF INTEREST to the building contractor and the home owner is the multi-



ple sash window patented recently. It consists of a frame with two or three sashes which may be swung outward individually or collectively. A clutch mechanism, which can

be disengaged when independent operation of one sash is desired, controls movement of the sashes.

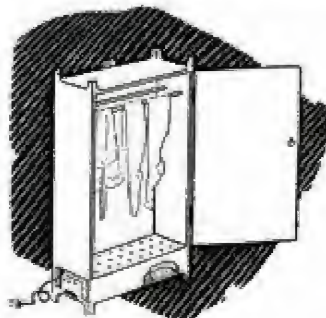
UNUSUAL illumination of the dining

table in public restaurant or in the home is provided in a patented table which has a glass top and means for lighting it from below. The top is supported by an opaque pedestal which contains the electric socket and



lamp with connecting wire and plug for attachment to a wall outlet. A reflector beneath the glass top illuminates a circular portion, creating a novel effect.

HANDY for the small apartment is a combined drying and cooking device



for which a patent has been issued recently. It consists of a boxlike structure with a chamber at one end for an electric heating element. The other part of the device forms

the drying compartment with room for several garments. It may be inverted to change its function from drying to cooking.

(Continued to page 62A)

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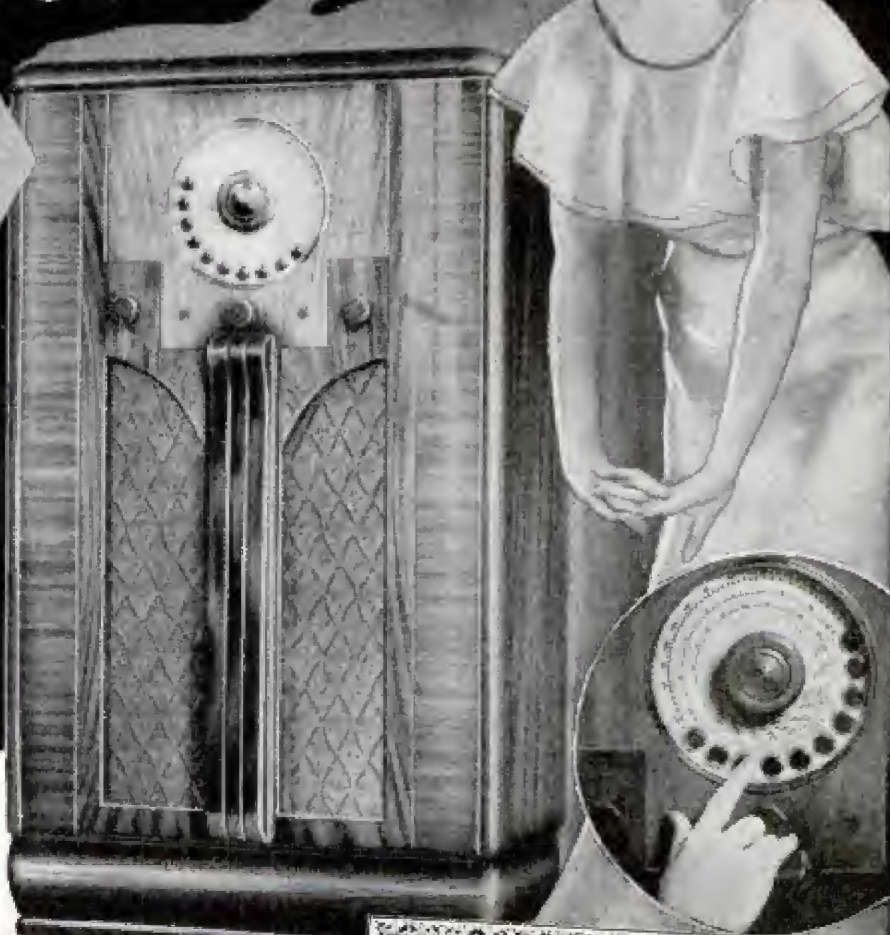
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GLORIOUS NEW TONE

Midwest gives you glorious, crystal-clear concert realism, brilliant world-wide reception and scores of advanced features, including Dial-A-Matic Tuning—at a sensationally low factory-to-you price! Zip! ...Zip! ...stations come in instantly, automatically, perfectly ... as fast as you can push buttons. The famous Midwest factory-to-you plan, proven by 18 years of success, is just as exciting. It enables you to buy at wholesale prices ... to save up to 50% ... to make your radio dollar go twice as far ... and to pay as little as 50 cents a week on the Midwest Easy Pay Plan. You get 30 days FREE home trial!



Not a cut-price set, but a bigger, more powerful, super performing COMPLETE radio in a big exquisitely designed cabinet of matched walnut.

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AS LOW AS
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TAKE advantage of the popular Midwest 30-day FREE Home Trial which enables you to try out this Midwest radio or any other Midwest for 30 full days ... in the privacy of your own home. You are the final judge. If you decide not to keep it—just send it back to us!

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Send me your new FREE catalog and complete details of your liberal 30-day FREE trial offer. (Special offer and prices prevail only when dealing direct with factory by mail.)

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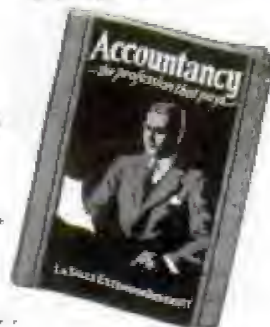
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REFINISH Your car. Instruction book treats all phases of painting and refinishing autos and trucks. Written for the man who wants to renew his own car, but covers also the business end of refinishing for the professional. \$1.65 postpaid. Popular Mechanics Press, Room (C37), 200 E. Ontario St., Chicago.

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DESOGAS Fuel oil converters \$4 up. Pretti Desogas, 1618 6th, Berkeley, Calif.

(POWERFUL) Leaky radiator sealer. (Harmless.) 40c coin. Agents wanted. E. O. K., Porterville, Calif.

MIDGET Cars, parts, plans. Catalog dime. Derby Midget Cars, Woodstock, Ill.

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DEMONSTRATORS. Compressor, test bench, 8-hour battery charger, arc welder. Guaranteed. Trial and terms. Hobart Welder Exchange, Box M-181, Troy, Ohio.

DIESEL Engine Digest \$2.50 year. Diesel Power \$3.00 year. Diesel Progress \$3.00 year. Pacific Marine Review \$1.50 year. Welding Engineer \$3.00 year—subscription without foreign. John Rodakowski, Hayden Bridge Road, Springfield, Oregon.

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AUTO Horn operating ring. \$2.50. 1938 Buick, Chrysler, LaSalle have them. Fits all cars. Nil Mellor, Waldorf Astoria, New York.

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CONVERT Your car to burn Diesel oil. Save up to 70% fuel costs. Cheap installation. Wonderful performance. Proven factory method. Different and better. Costs nothing to investigate. Write for free circular No. 4. Harrington Company, 201-204 Manchester Building, Portland, Oregon.

CURE Oil pumping. Restore pep, power. Increase gas, oil mileage. Easily installed segment rings, piston expanders. Guaranteed. Agents wanted. Haling, 4750A Sheridan, Chicago.

PLATING Outfits for auto parts. Connect to a battery. No tanks used. Free particulars and proofs. Gunmetal Co., Ave. J, Decatur, Ill.

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BUILDERS—A big 68 page book, tells all about trailers. How to plan and build the latest modern designs. Complete instructions, how to select and where to get dependable material and supplies. 350 illustrations, over 500 new and improved parts and accessories. Every phase of trailer construction is dealt with. The book is compiled by engineers engaged in trailer building. Send 25 cents, coin or stamps to cover postage and mailing. A. J. Stephens & Co., 2807B E. 14th St., Kansas City, Mo.

PARTS for the Popular Mechanics "Family Trailer" featured in the February, March and April, 1936 issues. Everything you need—Axle, hitch, wheel housings, water tank, pump, toilet, sink, stove, wood parts, windows, screens, lights, cushions, etc. Send for price list. Include 25c for our big catalog and Trailer Builders' Manual. Trailer Supply Co., 411 Jackson St., Wausau, Wis.

25 PIECE Beetleware service for four \$5.49 postpaid. State color. 600x16 Budd wheels, \$7.00 pair. Gem Trailer, North Bergen, N. J.

BUILD The beautiful Parlor Cabin trailer and land cruiser. Complete working details, 50c silver. Parlor Corporation, Greenwood Lake, New York.

BUILD The famous Jim Dandy cabin trailer—thousands on the road! A roomy, good looking trailer easy to build at low cost by anyone handy with tools. Complete plans and instructions—only 50c—give every detail of chassis, body, top, beds, cabinets, refrigerator, electric light and water systems and where to buy all parts. Can be built in any size to accommodate 2 to 4 people. Send 50c for these practical plans. Rush your order today to Jim Dandy, Box 1125, Wausau, Wis.

A. C. GENERATORS

PRACTICAL Changes for automobile generators. See our advertisement at bottom of page 127A. Autopower.

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SEND 10c For Handbook of Information, listing new and used parts, for Indian, Harley, Excelsior, Henderson; accessories, batteries. Bootz, 822 East Grand, Des Moines, Iowa.

INSIDE Dealer prices. Overstocked, all models, Indians and Harleys. Rebuilt, guaranteed. Dime brings latest list. Crandall-Hicks, Boston, Mass.

RECONDITIONED Motorcycles. New—used parts for all makes. Authorized Harley-Davidson dealer. Whitman Motorcycle & Supply Co., 405-9 Southwest Blvd., Kansas City, Mo.

SEND 15c For illustrated used motorcycle catalog. Bargains. Largest stock genuine Indian parts and motorcycles. Indian Motorcycle Sales, Kansas City, Mo.

REBUILT Motorcycles. all makes, new and used Harley-Davidson parts. Send 10c for bulletin. Western Harley-Davidson Distributors, 914 E. 15, Kansas City, Mo.

MOTORCYCLE Bargains. lowest prices, bargain sheets for stamp. Motorcycle accessories. Rochester Harley Davidson Corp., 129 W. Main St., Rochester, N. Y.

ALLOY Pistons—Harley, Indian, Henderson, Excelsior, new or used parts, cylinder grinding. Catalogue and wings pin 10c. Ballak, 1115 Chestnut, St. Louis, Mo.

AVIATION

AERO-SLEDS For ice or snow transportation, supplies. Details dime. Adastik Bros., Grand Rapids, Mich.

HEATH Motor Manual invaluable operation, overhaul, conversion, installation data Heath and Henderson motors \$1.00 or C.O.D. Cabin iced blueprint instructions \$1.00. Heath, Benton Harbor, Mich.

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73" CURTISROBIN Airplane kit \$1.50 postpaid. Gonsalves Airplanes, Woburn, Mass.

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YOUNG Men interested in entering aviation under apprentice plan see ad on page 36A.

SKY Flyer. Four foot model sailplane. Rises 2000 feet. Circles, dives for hours. Assembles in twenty minutes. 50c. No stamps. Hare Products, Whitinsville, Mass.

BOOK: 500 Aviation questions correctly answered. \$1.00. George Tuck, 73 Shirley, Pontiac, Michigan.

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PROPELLERS For airplanes, sleds. Also ice sled blueprints. Catalog dime. Lorenzen Propellers, Niles, Mich.

AIRPLANES \$50 Up. Motors, crackups, salvage. Complete directory 25c postpaid. Used Aircraft Directory, Athens, Ohio.

GET Into aviation. Air transport pilots get up to \$7,000 per year; mechanics \$2,500. Learn at this government approved school. Write for complete information. State age. Lincoln Flying School, 2004 Aircraft Bldg., Lincoln, Nebr.

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32 VOLT Light plants, parts for all makes, batteries, radios, appliances. M. J. Fitzgerald Co., Madison, Wis.

BUILD Wind light plant. We show you how. Complete plans and valuable catalog 10c. Wind plant parts, welders, electric fences. LeJay Mfg., 447 Lake, Minneapolis, Minn.

FACTORY Rewound 110 volt a.c. generators for lights, power, 1500 watts \$15.00; 300 watts \$5.00. Guaranteed. Monroe Mfg. Co., Box 3343, St. Paul, Minn.

REWOUND Auto generators give 110 volts a.c. for lighting outfit. Complete instructions in Shop Notes for 1937 only 50 cents postpaid. Popular Mechanics Press, Room (C37), 200 E. Ontario St., Chicago.

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HUNDREDS Of new, unusual, hard-to-get electrical items, replacement parts and supplies. Send for free wholesale catalog. Autopower, 410 S. Hoyne Ave., Chicago.

MAGNET Lifts 50 times own weight. Recover lost articles. \$1.00 postpaid. Particulars stamp. Amfadco, 861, Minneapolis, Minn.

ELECTRIC Pen engraves all metals, dollar prepaid. Hudson Bros., East Syracuse, N. Y.

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ARC Welding outfit \$1.50. Heavy duty, weld fenders, brake, solder. Layrow, 4368-W Warren, Detroit.

DODGE Arc-welder. Build your own. 40 volts, 25-200 amperes, direct current from old Northeast Dodge 12 volt automobile generators, 120 amperes from one generator, using ½ electrodes. 200 amperes, 3/16 electrodes from two generators, etc. Low cost and upkeep. Results guaranteed. Certified instructive plans \$1.00 C.O.D. \$1.12 airmail 12c extra. Welders Club of America-A. Box 3432, Merchandise Mart, Chicago.

75-125 AMPERE Arc welder from Dodge generator. Complete plans and catalog 35c. 50 other generator changes. LeJay Manufacturing, 347 Lake, Minneapolis, Minn.

ELECTRIC Welders, 110-220 volt, fan-cooled, can be used for hours, \$75.00. Box 331, Hamilton, Ohio.

WELDER Shortage. Big pay. Finest training and employment help. Wonderful climate. Folder. Dunn Welding School, 1308 N. E. Union, Portland, Oregon.

ELECTRIC Arc welder, only 23c a day! Sensational Commonwealth all-purpose, heavy duty, continuous operation arc welder, only \$5.75 down—balance payable over 10 months from profits. Handles all welding—lightest sheet metal to heaviest castings. Operates from any electric socket. Complete, nothing else to buy, 10-day trial. Details free. Commonwealth, Dept. D-55, Cincinnati, Ohio.

A. C. Arc-welder. Build your own. Results guaranteed. Instructive plans \$1.50. C.O.D. Box 48, Fairview, N. J.

SOMETHING New—110 volt electric brazing torch. Produces a 3 inch flame similar to an acetylene welder. Requires no gas or upkeep. Ready to use at the turn of a switch. Will last for years. Complete with all accessories—\$12.50. Dept. B, Apollo Mfg. Co., 319 Union Ave., Memphis, Tenn.

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REBUILT Electric arc welders, all sizes, a.c.—d.c. Service Co., 3732 Cedar Ave., Cleveland, Ohio.

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GOVERNORS For auto engines. Read our ad on page 132A. Mfg. Candee-Smith Governors.

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12-FOOT Flat bottom rowboat—complete plans 25c. Free boatbuilding catalog. The Rudder, 15 Murray St., New York.

BOAT Designers are highly paid professionals. Complete course by mail. Catalog. Westlawn, Montville, N. J.

BUILD Your own boat—New book gives plans, methods, etc. 312 pages \$3. Popular Mechanics Press, Room (C37), 200 E. Ontario St., Chicago.

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LISTEN: If it's dollars you can't make, write B. F. Spencer, 447 Central Ave., Batesville, Ark.

RESTAURANT Owners, want more profits? Management suggestions, recipes, etc., explained. What is your problem? Write Master Chef, 580 Market St., San Francisco.

FIVE Modern money making secrets \$1.00. Arlington Co., 875 Thornhill, Cleveland, Ohio.

START Home business resilvering mirrors, plating autographs, tableware, etc. Easy methods. No electricity. Literature free. Ideal, 100, Park Ridge, Ill.

INCREASE Your prestige and business. Just 1c daily for personal or 2c for business purposes, maintains permanent New York office. Co-Operative Mail Service, 126P Lexington Ave.

WORK At home, carve, paint and decorate gourds. Make radios, lamps, vases, charm strings, and hundreds other useful and ornamental articles from gourds. Book with 95 illustrations \$1. Gourd Studio, 1409 W. Holt, Pomona, Calif.

MONEY Making home propositions. Free particulars. Leslie, 3415 Fort Independence St., New York City.

GET Dollar bills in your mail daily. Nearly all profit. Particulars free. Homecraft Arts, PM, Lakeside, Calif.

SELL By mail. Big profit. Write Sweeper, 101 Monmouth, Newark, N. J.

AFTERNOONS Free for outdoors, movies. \$340 month home. Unique plans. No canvassing. Prepare for surprise. Folio-P, Station D, Los Angeles.

MAKE Money re-silvering mirrors. Formula only 15c. Boltach & Co., 5007 - 26th St., Detroit, Mich.

WE Are establishing associate manufacturers. 500% profit. Something new. Troughton, Aurora, Missouri.

OPPORTUNITY For man to get into something for himself—be own boss. No soliciting. Start with as little as \$75.00—a tried and proven money-maker. No previous experience required. Write H. H. Wing, Box R, Central Station, Toledo, Ohio.

POPCORN, Crispette, caramels, crisp, potato chip, salted nut machines. Long Eakins, 1960 High St., Springfield, Ohio.

PLASTEX Industries offer industrious men an opportunity to start a business of their own, manufacturing art goods, novelties and utility products in Plastex and marble imitation. The materials makes regular 10c store sellers. Rubber moulds furnished for speed production. Small investment brings big returns. Nationwide demand in these low priced goods for coming X-mas holidays. Ambitious men have chance for real prosperity. Plastex Industries, Dept. A, 1065 Washington Ave., New York.

WE Start you in business, furnishing outfits and instructions, operating Specialty Candy Factory home. Men and women, earn \$25 up to \$60 weekly, all or spare time. (Our 29th year.) Booklet free. W. Hillyer Ragsdale, Inc., Drawer 4, East Orange, N. J.

LIQUID Marble—anyone can make! Colorful, glazed! Moulded, brushed, sprayed. Rubberlastic moulds. Composition flooring. Big money in these! Particulars free. Marbleizing Service, Edwardsville, Ill.

SUCCEED With your products. Make sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

DONUT, Potato chip, cheese pop corn. Home made. Big profits. Vanderpol, Springfield, Ohio.

PROFITABLE Home business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

SELL By mail. Books, novelties. Bargains! Big profits! Particulars free. B. Ellico, 438 N. Wells, Chicago.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

I WANT To send you proof of the wonderful pulling power of Popular Mechanics Magazine's classified pages. What's your proposition? Write me today. F. W. Johnson, Manager Classified Advertising, 200 E. Ontario St., Chicago, Ill.

CHARTERS: Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del.

CASH Every week clipping and preparing news items for publishers. Simple, fascinating work. Experience unnecessary. Stamp brings information. Division 55, National Press, 3923 W. Sixth, Los Angeles, Calif.

HOW And where to obtain capital fully explained, free particulars. Star Service, Wapakoneta, Ohio.

DELAWARE Charters. Complete service \$35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Del.

ARTIFICIAL Marble sanitary flooring, instruction covering wood or cement flooring 1/2 inch thick, fireproof, all colors, low cost, ornamental casting, concrete, plaster, papier-mache, garden furniture, statuary, flexible molds, particulars free. Chris Mahler, Elmont, N. Y.

MAIL Order business is your opportunity. Many began small, now earn thousands yearly. No personal contact. Boundless opportunities. Have had over 30 years experience; will help you succeed. Send 25c for valuable booklets, none free. B. Brenner, 257 S. 21st, Philadelphia.

100 PROFITABLE Mail order and local plans. Gilbert Supply, 1107 Broadway, New York.

ZERPID, Fertilizer, 25c. Necessity for thousands. Sanquist Co., Pomeroy, Iowa.

MONEYMAKING OPPORTUNITIES

JUST Out! "Opportunities Hidden in Subscription Agency." New sales methods show how to build mail and phone business from home. \$1 postpaid. Money refunded if dissatisfied. Julius, Amarillo, 16, Texas.

WANT Extra income? Free folder describes 100 helpful plans. Dixon Co., 776P, Springfield, Mass.

EASY Work, all profit, coloring photographs, miniatures. Talent unnecessary. Inexpensive instructions, outfit. (Circular.) Hughes, 815-R4 So. Hill, Los Angeles.

WONDERFUL Moneymaking opportunities explained. Particulars free. Lewis Co., 828-P Carpenter, Oak Park, Ill.

AMAZING Plans, formulas, ideas, all money makers. Rowell, 240 Illinois, Rochester, N. Y.

WHERE To buy anything. 3 addresses 25c. Groat, San Bruno, Calif.

MAKE Low-cost expensive perfumes. Sample 25c. Belle Mead, (N. J.) Laboratories.

YOU'LL Like resilvering mirrors, autographs, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 287, Marion, Indiana.

GET Cash quickly, steadily! Home business. Spare or full time. Free details. Century, 1261-P Broadway, New York.

FREE! Extraordinary ideas, nationwide propositions. Evers, Box 66PM, Elmhurst, N. Y.

PRINCE Warren, Grant Hotel, Chicago, buys cancelled stamps. Particulars free.

QUIT Playing at the mail order business! Make real money—others are! "6000 word folio," 3c stamp. Dr. Swearingen, Station "S," Los Angeles.

FREE! Hundreds of moneymaking opportunities! Schumacher, 3503 Hirsch, Chicago, Ill.

TURN Spare time into cash with typewriter! Addressing envelopes, mailing circulars, typing! 25c (coin) brings information. Acc. TPM-7, 322 Empire, Birmingham, Ala.

PROFIT With your own business. Unusual opportunities. Learn how. Gordon Publications, Box 1137, North Adams, Mass.

IMMEDIATE Home cash! Starting outfit free! Tell Service, Gold, 1451 Broadway, New York.

MAKE Money. Easy electrical course. Complete 50c. Schrico Service, Cashton, Wis.

PROFITABLE Business. Free typewriter. Complete outfit 25c. Details free. Drawer A, Oil City, Pennsylvania.

1,000,000 ARTICLES Wholesale. Latest directory, 10c. Jelsmith, 163 Myrtle, Waltham, Mass.

START Mailorder business. Details free. Pederson, 1609 1/2 East Fifth, Duluth, Minn.

BIG Paying mail order business quickly developed. Working details 25c silver. Parlor Co., Greenwood Lake, New York.

MAKE It Yourself—Hundreds of practical and useful devices described in our big book. Plain instructions and illustrations show you how. Save money on things for yourself or make profit selling to others. 900 articles, 460 pages, 823 illustrations. \$3 postpaid. Popular Mechanics Press, Room (C37), 200 E. Ontario St., Chicago.

BE Independent. No canvassing. Write Leslie, 3415 Fort Independence St., New York City.

"SCHEMER" Magazine, Alliance, Ohio, supplies schemes, tips, ideas, formulas; winners! \$10,000 to \$25,000 reported. 39th year, \$1. Special: trial six months only 30c, year, 50c.

MAKE honest money at home. Free details. John Grady, Cosman Apts., Ithaca, N. Y.

PROFIT In vegetables, flowers, using chemicals. Remarkable yields. Quick growth. Experiment now. Proven formulas. Enough chemicals for 40 gallons solution and instructions \$1.00 postpaid. Quick Growth Solutions, Hollywood Sta., Box 648, California.

SENSATIONAL Opportunities! Particulars free. Sine, 323 South Eighth East, Salt Lake City, Utah.

OVER 100 Ways to make money. Home or office. Literature 25c. Texas Sales Office, Westaco, Texas.

STOP Squealing—Start crowing! Work mornings home—drive to country—"movies"—afternoons! No canvassing! Folio-A, Station "D," Los Angeles.

START Profitable mail order business at home. Stamp brings details. Success Publishers, 5625 So. Flores, San Antonio, Texas.

MAN in each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. N. Decatur, Ill.

NEW All profit plans. Kurtz, 3541 94th St., Jackson Heights, N. Y.

RAISE Earthworms for profit. Information free, stamp appreciated. Bureau Zoological Research, 106A Broadway, Peoria, Ill.

MILLIONS Jobless! Get dollars in mail daily, like we do, for amazing employment information. Keep money; we fill your orders free. Stamp brings details. Co-Operative Service, 77 Swan, Buffalo, N. Y.

MOULDS. Guaranteed, for casting toy soldiers, Indians, trappers, warships, sinker moulds, 244 kinds. Send 5c for illustrated catalogue. Henry C. Schlercke, 645 Spencer, Ghent, N. Y.

WHOLESALE Sources, 500,000 articles. Free directory. Maywoode, 925 Broadway, New York.

107 PLANS For making \$20-\$100 weekly in home or office business of your own. Descriptive booklet free. Elite Co., 214 Grand St., New York.

LIKE To draw? Earn steady income tracing and duplicating advertising cartoons. Ad-Service, Argyle, Wis.

FORMULAS, PLANS, ETC.

MAKE Liquid floor wax. Formula 50c. Money maker. Western Formula Co., Box 23, York, Nebraska.

EASY Money. Formula for making best penetrating oil on the market. 300% profit. Directions for making and selling 50c. W. A. Farnsworth, 801 W. Main St., Bellevue, Ohio.

GUARANTEED Formulas—New fast sellers. None better. Lowest prices. Catalog free. Kemico, 49N, Park Ridge, Ill.

DOLLARS And days perfecting our formulas. They work! Box 322, Los Angeles, Calif.

1938 BEST Sellers: Circular free. Catalog 25c. Grinstead, 505 Fifth Avenue, New York.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

NEWEST Formulas. Everything. Specials! Catalogue free. Manufacturers' Service, 489 Arcade, St. Louis, Mo.

WE Give formula, instructions and quotation on ingredients, any product, \$1.00. Federal Laboratories, Box 200, Jersey City, N. J.

\$1.00 BRINGS Formula for North Pole Anti-Freeze and Rex-battery Charging Powder; guaranteed. Nu-Way Sales Co., Hornell, New York.

"TWO Dimes" brings plan, formula, sample, that's sweeping country like tornado! Satisfaction guaranteed! Davis, Box 1484-P, Clarksburg, W. Va.

ANY Formula 30c or money back. 1938 catalog free. Ogg Laboratories, Tampa, Florida.

MAKE. Sell—Brushless shaving cream, anti-freeze solution, mechanic's hand soap, glass cleaner, magic dishwash. Guaranteed formulas. 50c each, any three \$1.00. Progressive Laboratories, Box 74, Sta. A, New Haven, Conn.

GUARANTEED Formulas, 100 for 20c coin. Edwards, 1700 Locust, Quincy, Ill.

100 MONEYMAKING Formulas 25c. Descriptive literature free. Harvey Teeple, Decatur, Ind.

THAXLY Formulas for perfect products. Accurate analysis assured. Resultful research. Catalog free. B. Thaxly Co., Washington, D. C.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

FORMULAS. Latest money makers. Literature free. Belfort, 4042 N. Keeler, Chicago.

CHEMISTRY

CHEMICALS In 5c quantities. Catalog 5c. Fleischer's Laboratories, Everett, Mass.

RUBBER Latex sample twenty experiments for quarter. Eastern Latex Labs., Box 53, Canton, Mass.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices leads. Gibson Laboratory, Chemists, CT-1142 Sunnyside, Chicago.

CHEMISTRY Magazine—research. experiments—three months subscription 15c. Spanner, 100 Forsyth, New York.

MAGIC Chemical Submarine, chemistry magazine, book experiments, new chemical catalog; all for 10c. Clinton Chemical Company, Swedesboro, New Jersey.

HANDBOOK For chemical experimenters, hundreds of experiments, illustrated, 50c. Experiment booklet, 15c. Chemical catalogue, 10c. Reading Scientific Co., Reading, Penna.

FREE Chemistry catalog. Supplies at 5c! Equip complete laboratory. Send 3c for postage. Kemkit Scientific Corp., 397P Bridge St., Brooklyn, N. Y.

CHEMICALS. Laboratory glassware, apparatus. Send 5c for catalog CP-1. Biological Supply Co., 1176 Mt. Hope Ave., Rochester, N. Y.

CHEMICALS For all purposes. Equip your laboratory. Catalog 10c. McBee Chemical Co., 1624 Boren, Seattle.

AGENTS WANTED

MEXICAN Finest leather pictures: 4x9" costs 25c including duty, retails \$1.00. (Sample 20c stamps.) Embroidered tablecloths: 36x36" with napkins costs \$1.18. Retails \$2.50. (Sample \$1.00.) Free particulars. Marquez, Apartado 1176-P, Mexico City.

SALES Agents—To sell direct to the automobile and truck owners, an absolute safety device on large commission basis. No Skid Company, Liberty Bank Building, Wilkes-Barre, Penna.

100% PROFIT In new perfected (1938) quick-action self-starting cigar lighter. No flint or friction. No wind can blow it out. Retails 25c. Costs you \$1.75 dozen. Sample and can fluid 25c. New Method Co., Box PM-61, Bradford, Penna.

AGENTS For pipe. Patent rights covered. Every smoker a prospect. Big profits. Permanent business. Samples carried in pocket. Good side line. Write Al. H. Hoffman, 776 E. Alosta Ave., Glendora, Calif.

AGENTS: Smash go prices! Santos coffee 12c lb. 4 oz. vanilla 8 1/2c. Razor blades 10 for 8 1/2c. 100 sticks chewing gum 12c. 150 other bargains. Premiums. Experience unnecessary. Carnation Co., PO. St. Louis, Mo.

NEW Soapless cleaning discovery! Amazing repeater. Enormous profits. Sales guaranteed. Free sample. Chicago Products, AF-3968 Avondale, Chicago.

COAL And oil burners save 15% on your fuel bill—automatic dampers \$6.95 easily installed. Guaranteed. Free literature. Agents wanted. "X" Coal Co., 2924 East Lake Street, Minneapolis, Minn.

STRANGE Ironing cord. Prevents scorching. Saves electricity. Abolishes kinks and snarls. For telephones also. 150% profit. Sales guaranteed. Samples furnished. Neverknot, Dept. 1-A, 4525 Ravenswood, Chicago.

500% PROFIT Selling new 20-in-1 kitchen utensil. Retails 25c. Costs you \$1 a dozen or \$6 a gross. Sample 10c. New Method Co., PMM-61, Bradford, Penna.

LOCAL Agents wanted to wear and demonstrate free suits to friends. No canvassing. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. H. J. Graves, Pres., 1300 Harrison, Dept. A-817, Chicago.

SELL Tinselled Christian mottoes to homes, big profits. Novelty Signs, Stryker, Ohio.

SWEETEST 25c Seller out! Gold embossing ink, decorate Xmas cards, Easter eggs, etc. Sample 15c, catalog free. Heil Co., Gaylord, Minn.

LIQUID Typewriter type cleaner. B. Omoto, 2619 Hyperion, Hollywood, Calif.

BE Your own boss! Operate used-new clothing business from store, home, auto. Over 100% profit. Everything furnished. Catalog free! Roosevelt Mercantile, 550-F Roosevelt, Chicago.

MAGIC Clothes brush. Revolutionary invention. "Erases" dirt like magic. Saves drycleaning. Sensational seller. Samples sent on trial. Rush name. Kristee, 128, Akron, Ohio.

YOU'LL Like resilvering mirrors, auto-parts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 128, Marion, Indiana.

NEW Deal giving away shoes. Spare or full time. Outfit free. Reed Sales Co., Brockton, Mass.

HOLDS-UM Dry powder cement. Holds anything, anywhere. Fireproof, waterproof, never shrinks. Five ounces 25c; pound 65c delivered. Holds-Um, Royal Oak, Mich.

5c WILL Make you \$1 profit. Free sample product. Free literature. Fastest winter seller. M. A. Baske, 507 W. Barnes Ave., Lansing, Mich.

450% PROFIT Quick-Action automatic gas lighter. No flint. 25c seller to every home, office and restaurant. Free sample. New Method Co., Box PMG-61, Bradford, Penna.

\$200.00 A MONTH! Only 10 \$1.00 sales daily pays \$50.00 a week. An auto product. Thermo-Power Works, Peoria, Ill.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

500% PROFIT! Gold reflecting letters for store windows. Large sizes 1c. Free samples. Modernistic Sign, B-3004 Lincoln Ave., Chicago.

NO Peddling. Start home business. Little or no investment. Free booklet tells how. Century, 1261-PM Broadway, New York.

VALUABLE Samples medicated bandages 10c, plans, proof, money back. "Gayspads," 190 Dwight, Holyoke, Mass.

AMAZING New scientific discovery cuts coal bills 40% to 60%. 75c package treats a ton. Every home and building a prospect. Agents cleaning up. Write for free sample. WCS Products Co., Beverly, Mass.

WHOLESALE Price list free, razor blades, notions, hosiery. Bulger, 147B Pemberton, Cambridge, Mass.

AGENTS. "National Opportunity Catalog" 10c. 4101 S. 38 Avenue, Minneapolis, Minn.

YOUR Opportunity for permanent income. Quality uniforms for quality buyers! Exclusive styles and models. Large profits. Restricted territory! Free outfit. Write today. Lion Uniform Co., Dept. M-18, Dayton, Ohio.

STARTLING Invention—Pocket adding machine. Nationally advertised \$2.50. Whirlwind seller. Big profits. Calculator Mfg. Co., Box 1118, Chicago.

MONEYMAKER. Proven proposition. Stamp brings information. Johnston, 1051 S. Central, Lodi, Calif.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 20A.

START 1938 Right! Making newest staple products to sell, repeat, with Miller's Famous Certified Formulas. Investment small—profits great! Valuable literature free! Miller, Chemist, 1706-M, Tampa, Florida.

JAY-WAY Door holder, sensational moneymaking. Jay-Way, One E. 42nd, New York.

GUARANTEED Gold leaf letters for store and office windows. 500% profit. Free samples. Metallic Co., 438-B N. Clark, Chicago.

ATLAS For best gold reflecting window sign letters. Large sizes 3/4 cent each. Free samples. Atlas, 7941 Halsted, Chicago.

BIG Money applying initials on automobiles; \$1.45 profit on each sale. Write for particulars and free samples. American Monogram Co., Dept. 46, Dunellen, N. J.

MAKE Full strength, non-explosive, non-inflammable, odorless cleaning fluid from benzene crystals, 1c gallon. Sample 25c. Literature free. Western Reserve Laboratories, 6615 Denison Ave., Cleveland, Ohio.

SELL Novelty fun cards, novelties, etc. Samples 10c. National, Box 500M, Cincinnati.

MAN in each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. H, Decatur, Ill.

BIG, Steady weekly profits for men and women with cut price food route. More than 300 fast selling household and farm necessities. Sensational premium deals get quick cash and build profitable routes quickly. Write Bleecker, 259 E. 4th St., St. Paul, Minn.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 149 Fifth Ave., New York.

SUCCEED With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

AGENTS—Opportunity to make money; book containing 107 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

WANTED—District purchasing agents. No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chicago.

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents," is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

MANUFACTURE Specialties, hire agents yourself. Big money. Free literature. Gilbert Supply, 1107-P Broadway, New York.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

HIGH-GRADE SALESMEN

INTRODUCE New advertising idea to retailers. Show them how to give away free chewing gum and increase profits! Send for big-commission plan, free sample outfit. National Adgum, Dept. K-20, Cincinnati, Ohio.

NATIONALLY Known chemical corporation considering applications from salesmen experienced in selling disinfectants, insecticides, cleaning compounds, floor maintenance products, deodorants, etc., to factories, schools, institutions, municipal and county buildings, and other direct bulk users. References required, own automobile, protective contract given, drawing account considered. The Federal Sanitation Co., Inc., 2340 Euclid Avenue, Cleveland, Ohio.

NO Selling! Steady work—Big pay daily. Be my local buyer. Money furnished. Details free. Pruitt Co., 1180 Pruitt Bldg., Chicago.

SHIRT Salesmen. Sell Johnstonian fine shirts direct to wearer. Self-selling sample kit free. Daily commission. Johnston Shirt Co., Union City, Tenn.

ADVERTISING Book match factory offers you amazing opportunity. We are largest in world selling direct. Big cash commissions, bonuses. Full-part time. Big repeats. Samples and kit free. Match Corp. of America, Dept. E-1, 6041 Grand, Chicago.

MAN Wanted to supply Rawleigh's household products to consumers. Sales way up this year. We train and help you. Good profits for hustlers. No experience necessary. Pleasant, profitable, dignified work. Write today. Rawleigh's, Dept. A-53-PPM, Freeport, Ill.

SELL Grooved felt back changeable signs with double prong celluloid letters to all stores. Big commissions. P. Pricing Press, 124 White St., New York.

SELL Nothing. \$95 weekly. \$500,000 punchboard firm announces new, no investment plan. Season starting. K&S, Dept. C121, 6227 Broadway, Chicago.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Farrell cleared over \$1,000.00 monthly. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

WANTED County distributors. Excellent opportunity for earnings. Nationally advertised product. Large company. Dept. 252, Fyr-Fyter Company, Dayton, Ohio.

\$100 WEEKLY. Installing new automatic fire-detector-burglar alarm system. Homes, farms, warehouses. Complete \$6.50. Territory. Fyre De-Tector Co., Thorp, Wisconsin.

JUST Out. Big sensation. New hand cleaner, big profits. Money back guarantee. Full size box 25c. McArthur Products Company, 13332 Compass, Detroit, Mich.

GREATER Commissions. Increase your income selling \$10,000 accident and health policy; \$25-\$50 weekly benefits. \$10.00 yearly. Other amounts proportionate. Guaranteed renewal income. \$1,045.318.19 securities deposited. Universal Policy, Dept. O, 11 Commerce St., Newark, N. J.

BE Your own boss. Make the largest commissions selling our complete line of brushes. Write for sales plan. Wire Grip Sanitary Brush Corp., 2300 5th Ave., New York.

New Power Air Auto Vac, no bag or hose, quick sale on demonstration to garages, gas stations. Big profits. Sales-manager, 2417 N. Ashland, Chicago.

PERMANENT. Exclusive agency. Our unusual products still used steadily in the homes after 37 years. Rayburn Sons, Chemical Specialties, 5946 Eggleston, Chicago.

WANTED—District managers, distributors—age 25-55—to investigate and interview dealers for sensational merchandising plan. (Requires no selling.) 100% credit insurance on merchandise. Profits up to \$300.00-\$600.00 month. New scientific method conditions automobile motors few minutes, while motorists wait. (No graphite—no mica.) Easy to use. Saves time, money, gasoline, oil. Lloyds of London insurance to \$5000.00 protects users. Method and proposition alone in field. Guaranteed results. Your profits up to 233%. Write today for details free of risk test and "profits-or-money-back" plan. Territories going fast. Rush. Craver and Jay Company, Dept. 101, 21 West 10th, Kansas City, Mo.

TIRE Accessories. Guaranteed 10,000 mile Tiger Grip Tire Patch, and complete fast-selling line auto accessories. Salesmen-distributors easily make up to \$75 weekly, and over. Protected territory. Economy Rubber Products Co., 839 Burkhardt, Dayton, Ohio.

WANTED Representatives. Sensational burglar and fire alarm. Real money maker. Exclusive territory. Be independent. Automatic Alarm Co., Cadillac Square Building, Detroit, Mich.

SALESMEN—Sell business stationery, book matches, calendars, Xmas cards, advertising pencils, shelf moulding, labels, salesbooks, pricing sets, tags, office supplies. Business cards \$1.50 thousand. 35% comm. daily. Free deals. Sales portfolio free. Willens, 2130 Gladys, Dept. WK, Chicago.

SALESMEN, Distributors. New deal, higher commission; exclusive territory. 125 varieties brushes, mops, specialties. Neway Brush Co., Hartford, Conn.

GUARANTEED Gold leaf letters for store windows. Free samples. Liberal offer to car owners. Metallic Co., 438-A N. Clark, Chicago.

ATLAS For best gold reflecting window sign letters. Large sizes 3/4 cent each. Free samples, Atlas, 7941 Halsted, Chicago.

SALARY Or commissions. Permanent. National Salesmen's Bureau, Taylor Bldg., Rochester, N. Y.

MAKE More money with Red Comet Automatic Fire Extinguishers. Low price. Proved seven years. Splendid sales outfit free. Some good territory open. Exclusive. Write quick. 704 Red Comet Bldg., Littleton, Colo.

BRUSH Salesman—If you ever sold brushes write for our money making proposition. Donald Brush Co., Camden, N. J.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

SPARKLING Glo-Brite signs sell fast to stores, restaurants, taverns. Lasting gold finish. Plenty profit. J. A. Baxter, Cambridge, Ohio.

"1,000 WAYS To Make \$1,000." You can do it—others have. This amazing book will startle you. 475 pages, only \$2.50. Popular Mechanics Press, Room (C37), 200 E. Ontario St., Chicago.

HELP WANTED

MEN Wanted for coffee routes. Earnings up to \$45 in a week. Automobile given producers as bonus. Write Albert Mills, 8835 Monmouth, Cincinnati, Ohio.

"WEAR-EVER" Aluminum has sales opening in Chicago territory. Future for man selected. Not canvassing. Car essential. Average earnings \$60 weekly. Write Mr. Ogden, 1313 Conway Building, Chicago.

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 20A.

STOP Job-hunting. Be your own boss. Start profitable mail order business of your own. No selling. Write Hant Service, 516-Y Federal, Pittsburgh, Penna.

MODERN Refrigeration. New industry needs trained men for installing, servicing, repairing. If you seek a new field with larger opportunities get latest book by Alt-house and Turnquist, \$5 postpaid. Popular Mechanics Press, Room (C37), 200 E. Ontario St., Chicago.

EDUCATIONAL AND INSTRUCTION

AIR Conditioning, electric refrigeration industries demand trained men for installation, service, maintenance and sales. Qualify in 3 months. Free employment service. Established 34 years. Get new book "Step Up to Success" free. Write O. Werwath, President, 1020-S N. Broadway, Milwaukee, Wis.

"SHORTHAND Simplified" complete \$1.00. Folder-less dime. Simmons, Rocky Hill, Conn.

KNOCK-EM-COLD! Learn police Jiu Jitsu! 36 secret knockout blows without fists, many one-fingered, headlock breaks, etc. New complete illustrated course by world-famous instructor, only 15c today. S. J. Jorgensen, Maritime Bldg., Seattle, Wash.

BECOME An investigator—Secret service agent. New "Test Problem Method." Develops your ability. Particulars free. International Secret Service Institute, (PM18), Hoboken, N. J.

MAKE More money. Get a U. S. government job. Get our new plan for obtaining one—no obligations. Age 18-50. Write, Instruction Service, 101, St. Louis, Mo., immediately.

1938 GOVERNMENT Jobs. Start \$105-\$175 month. Dependable. Prepare immediately for next examinations. List positions, free. Write today. Franklin Institute, Dept. L3, Rochester, N. Y.

BECOME Business investigator. Earn good fees in pleasant spare-time work. Write! Business Detective System, 1009 Oak, Elmira, N. Y.

ASTROLOGY Taught—weekly lessons, help, corrections, 50c. Albert Byron, 163 Holden St., Providence, R. I.

LEARN Air conditioning—America's next big industry. Thousands of opportunities. Get your start with complete book by E. W. Riesbeck, \$3.50 postpaid. Popular Mechanics Press, Room (C37), 200 E. Ontario St., Chicago.

GOVT Jobs start \$1260-\$2100 year. Men-women age 18-50. Former examiner's tested method helps qualify you. Particulars, list jobs free. Write today. Patterson School, 8C Mercantile Bldg., Rochester, N. Y.

DEGREES Earned by home study in arts, sciences, philosophy, education, psychology, theology, law, chemistry, engineering, business, agriculture. McKinley-Roosevelt College, Chicago.

HIGHER Arithmetic solves problems quickly. Frederick A. Smith, 2410 Bernard St., Chicago.

SECRET Investigations. Excellent opportunity. Particulars free. Write George Wagner, M-2640 Broadway, New York.

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NOVELTIES: 12 Assorted samples 10c. Novelties, 1525 Grove, Lafayette, Ind.

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MONEY In butterflies, moths. See Sinclair Display Advertisement on page 20A.

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SWAPPER'S Friend, R4, Saline, Mich. Interests swappers, collectors, sportsmen. 50c year, sample 10c.

AMATEUR Tattooing outfits, illustrated catalog 6c. "Tatuco," 651A S. State, Chicago.

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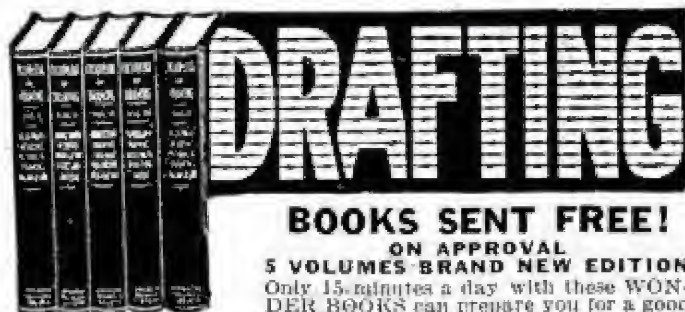
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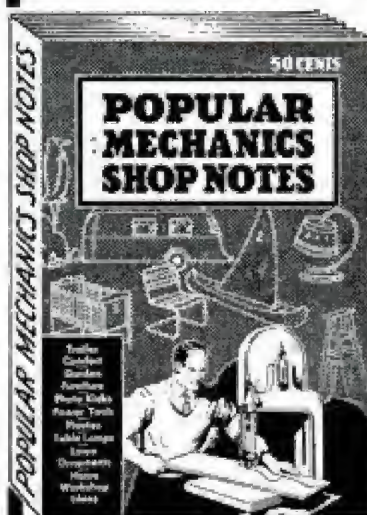
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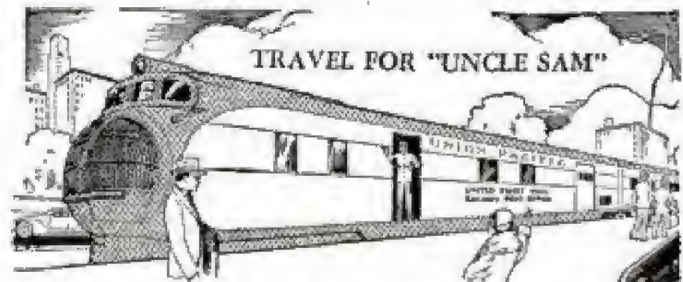
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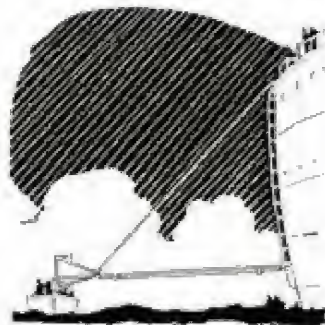
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NEW INVENTIONS

(Continued from page 42A)

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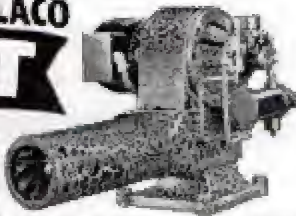


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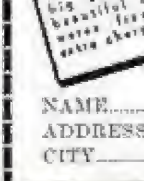
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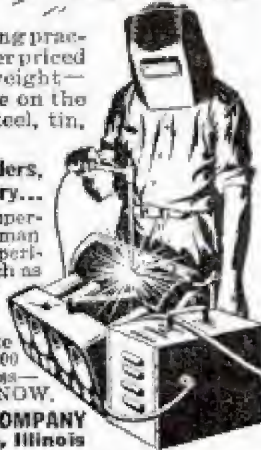
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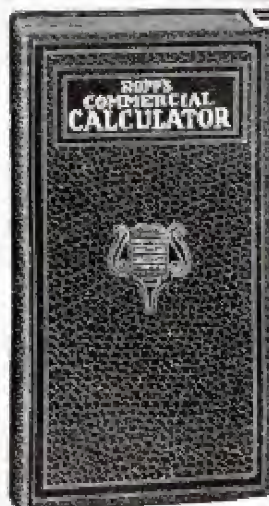
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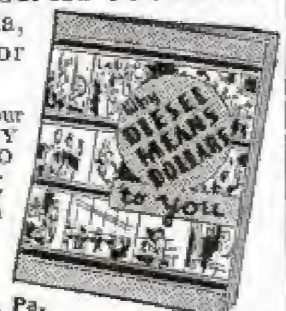
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JANUARY, 1938

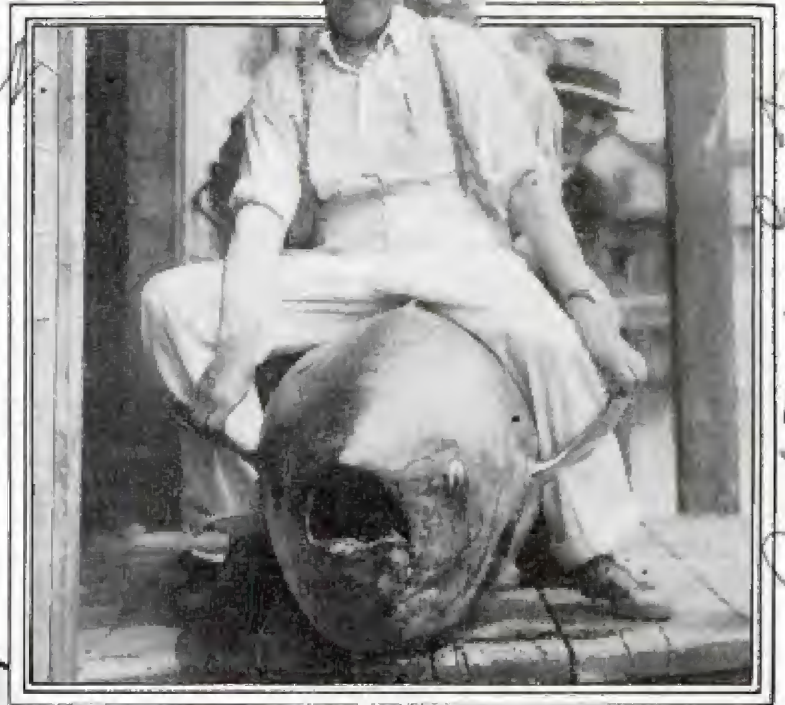
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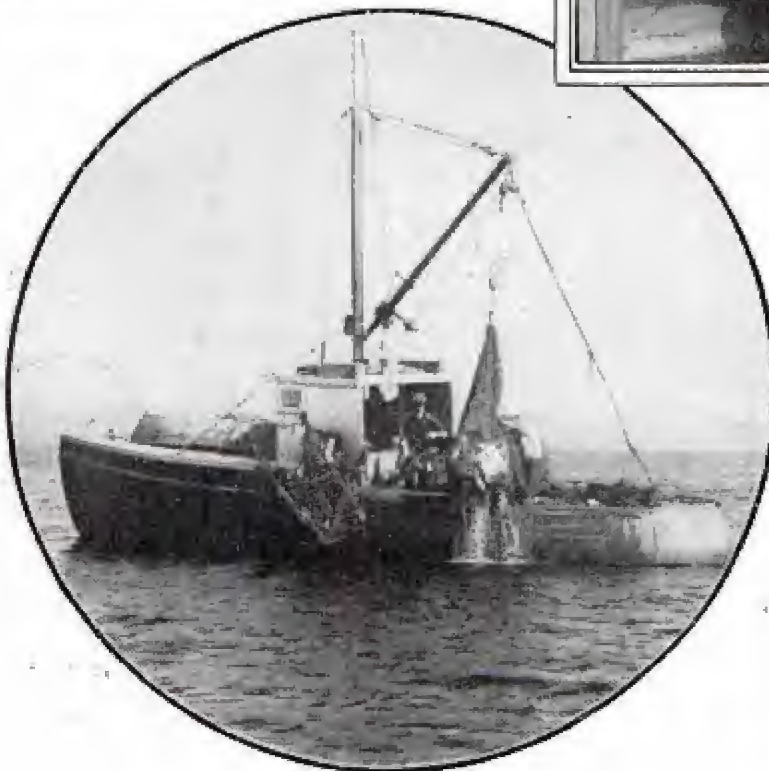
By Charles Morrow Wilson

new land
PROGRESS in ocean industries is taking two directions, marine farming and better processing of sea products.

The French government instituted ocean experiment farms as early as 1910, but the work was halted by the world war. Today the United States is leading the world in salt-water agriculture with a sea-food catch worth about \$100,000,000 a year at the docks and about four times that when completely manufactured.



Top, riding a record catch weighing 700 pounds. Bottom, hoisting a catch of ground fish. This is a typical two-man fishing vessel



Marine farming begins at the shore line with field cultivation of clams, one of the four greatest ocean foods. The state of Maine, with about 500,000 acres of tidal flats capable of growing clams, has opened a clam experiment farm at Friendship. Mud between high and low water marks is plowed by tractors and small "seed-size" clams are sown as one would sow a grain crop. The crop requires two to three years to mature and in good locations yields from 800 to 1,200 bushels to the acre, worth

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fifty from an average brood may reach market size or a minimum of one pound.

The growth period for market size, usually stated by law as a minimum body length of three inches, is about five years. In the hatchery, baby-lobster diet is actually more fussy than that of the human baby. The best fare seems to be ground hog's liver, which is fed through strainers into the brooder trays. Another important step in lobster farming is the lobster pound, or ocean barnyard. Feeding pounds are usually corrals built of seine-covered pickets at the tips of inlets. Live lobsters are taken from the

traps, placed into the pounds and fed two or three times a week. In this way they are kept in good flesh to meet market demands.

Oysters are another sea crop now being planted in submarine fields. But the newest ocean "field crop" is

from \$400 to \$750. The most valuable popular sea food is lobster, which thrives in a twenty-mile strip of the Atlantic coast line from the Carolina capes to Labrador. For some years the lobster industry has been threatened by failing supply. In Maine, greatest of lobstering states, the yearly catch has fallen from twenty million pounds to five million. This is leading to the establishment of a new style of lobster farming. The newest feature is the modern rearing station. The largest of these hatcheries is maintained cooperatively by Maine and the U. S. bureau of fisheries at Boothbay Harbor.

Though the adult female lobster sheds from 8,000 to 12,000 eggs each year, natural survival is only about two lobsters out of that number. The eggs and newly hatched lobsters float at the surface for about twenty days. During this period the mortality from gulls and fish is tremendous. With modern hatchery methods lobster experts believe that as many as



Top, feeding young lobsters in hatchery. Center, fourth-stage lobsters ready to be released. Bottom, hatchery tanks in which young lobsters are raised

the scallop, whose edible portion is the "eye" or abductor muscle. The crop usually flourishes on flat sandy bottoms under sixty feet or more of water. The scallop industry began to gain importance upon the Maine coast about fifteen years ago and now has grown to such importance on the Atlantic fishing front that interested states and the U. S. government are beginning to replant the more productive shoals which are becoming exhausted. This is done by purchasing small live scallops and transporting them to the desired location where the seed are scattered overboard. Then the area is closed to dragging for a period of a year or more.

A scallop boat is usually a stout Diesel-driven craft costing from \$5,000 to \$30,000. The crop is harvested by means of twin drags, towed from either side of the vessel. The drag is an iron framework from six to twelve feet long and about two feet deep, with a netting bag attached. The framework is pulled by means of a steel cable about 1,000 feet long, and is hoisted by Diesel power about twice an hour for a take of from six to twenty bushels to the drag. The scallops are dumped on deck, culled and placed on shucking benches. Crew workers pry open the shells, recover the abductor muscles, wash the meat, pack it in iced canvas bags, throwing the waste portions overboard. The product is packed in airtight tins to improve flavor and shipping qualities.

On a tonnage basis school fish are still the greatest ocean harvest. These are divided into ground fish, such as cod and haddock, which ply only a few feet above the ocean bed, and surface fish, such as mackerel and herring, which swim only a few feet beneath the surface. Herring is the most numerous of all ocean fish though commercially mackerel is the most valuable surface fish and haddock is the most valuable ground type. The great bulk of all sea-fish catch is made offshore on the fishing "banks," which are underwater ledges protruding from twenty to 600 feet below the surface, with 240 feet the most common fishing depth. Most of the food fishes ply in schools, ranging from a few dozen to millions. Ground fish are caught with hand lines and hooks, trawl lines, or deep drag nets. Surface fish are scooped

(Continued to page 158A)

Electric Exercise for Eyes Helps to Correct Squint



Peering through eyepiece at lighted figures of this instrument, patient is given eye muscle exercises

Like every other organ, the eye needs exercise to strengthen it. An electrically operated instrument was invented recently for the purpose of correcting squint and giving the eye muscles exercise. The subject looks through an eyepiece at lighted figures on the front of the machine.

Rocking Chair Propels Odd Boat by Turning Paddle Wheel

Propulsion of an unusual water craft placed in operation recently is accomplished by rocking in a chair. The chair is attached to large driving arms which cause a paddle wheel to revolve at the rear of the boat. A large steering wheel controls directional movements.



Rocking the chair propels this unusual craft

Watchmaker's Home and Shop Built in Truck



Top, right, watchmaker standing beside his home-and-shop. Left, ready for sleep. Center, folding bunk. Bottom, preparing meal on the gasoline stove



neath the bunk is a clothes compartment with space for ten pairs of pants, a dozen shirts, underwear, socks and towels. Back of the bunk, against the wall, is space for two suits in zipper bags. A folding basin with rubber drain hose extending through the floor fits into a separate compartment in the bunk. Just above is another compartment for toilet articles. A folding gasoline stove with two burners and a hood to carry away vapors makes it possible for the occupant to cook his own meals. A tourist refrigerator, a pantry box and a dish-pan fitted into friction-tight grooves are other features. In addition, a completely equipped watchmaker's cabinet and tool shelf have been built into the truck. Other equipment includes a two-gallon Thermos jug for drinking water, large collapsible easy chair, hot-water heater, camera and first-aid box.

Built into an old model truck are home conveniences and a workshop for the watchmaker-owner who takes his business to the customer. Among the features is a folding bunk which is six feet long when ready for sleeping, five feet long when ready for traveling. At one side is a book-case holding twenty volumes and a radio. A fixed light provides illumination. Be-

Snow Trails Tell Census Taker Wild Life Population

Taking the census of wild life, particularly the fur-bearing animals, calls for experts who can read snow tracks. Following fresh trails, the census taker can locate dens or burrows and then from a careful study of the various footprints around can

1877
 Baldwin
 Harwood
 1298

High-Speed Super-Locomotive Built to Haul Crack Train



Here is the front of the giant steam locomotive which will pull a long string of passenger coaches at 100 miles per hour.

Constructed to haul the Super-Chief, crack Chicago-Los Angeles train, a giant locomotive was completed recently at the Eddystone, Pa., plant of the Baldwin Locomotive works. It is one of six super locomotives being built for the same railroad to haul long passenger trains at 100 miles per hour.

Grounded Ship Causes "Quake" Rattling Houses along Shore

When a 5,630-ton freighter ran aground in a dense fog at Seattle recently the crew was scarcely aware of the beaching but it caused a minor "earthquake" on shore. As the steamer "Charles Christenson" struck the gravel beach the shock was transmitted through the earth to houses nearly a block away, shaking windows and rattling dishes violently.

tell how many animals live there, and the approximate age groups. The Bureau of Biological Survey has found it quicker, more economical and reliable to count deer and elk by spotting them from airplanes. Airplane counts have also been found helpful in estimating the number of waterfowl in lake regions.

Sliding Top Car Gives Amazing Gas Mileage

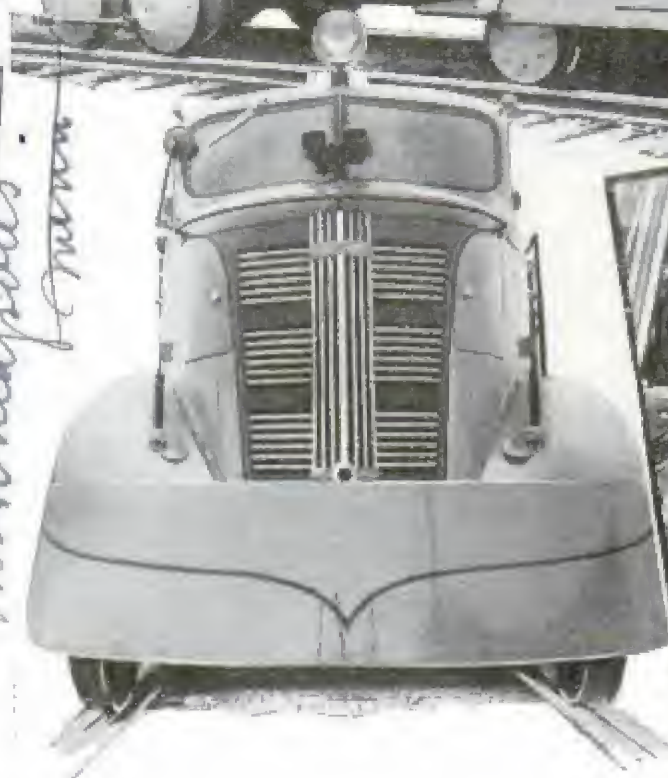
Designed to run more than forty-five miles on one gallon of gasoline, a small Italian-made car was introduced in the American market at the New York auto show. The cabriolet model has a one-finger sliding top, a new development in convertible top adjustment, which is waterproof and rattleproof. The car has an all-metal body, independent front-wheel suspension, hydraulic brakes and synchromesh transmission. It will compete with American autos in the low-price field.



Converting Italian car by sliding back the top. This car gives exceptional gas mileage.

Truck Adapted to Railroad Hauls Big Loads

Three views of the new rail truck. Top and bottom, left, the truck on test run. Bottom, right, at the controls in the truck. Note that controls are locomotive type



Designed to meet the need for a cheaply operating locomotive on secondary railroads, a standard truck has been adapted for use on rails. It is capable of hauling two loaded freight cars. Higher-powered models capable of pulling eight to ten cars loaded with freight or passengers are possible. For converting the truck to railroad use, a new differential employing a four-wheel drive was substituted for the standard drive. One set of gears is used and the two sets of drive wheels are linked by tie rods. The wheels are rubber cushioned, insuring quiet operation, and air brakes are used, with standard railroad couplings. Throttle and other controls, except for the reverse gear, are of locomotive type. A special transmission permits the same number of speeds in reverse as forward, so that

the rail truck may run at full speed in either direction. Lights are mounted like those on a locomotive and a dual horn and bell are provided.

Original Bell Phonograph Plays After Half Century in Vault

Sealed away in a metal-covered wooden box fifty-six years ago, the original Bell phonograph was recently taken from its vault in the Smithsonian Institution and its first wax record played again through a modern loudspeaker. Thomas A. Edison had invented a method of recording on tin foil four years before Alexander Graham Bell and his co-inventors developed the wax cylinder, but the tin-foil system was

unsuccessful. Bell, Charles Sumner Tainter and Chichester Bell had their "graphophone" and the original record sealed away with instructions that the box should not be opened without permission of two of the inventors. The Bells are now dead, but Tainter, 84 years old, invalid at San Diego, and the descendants of Bell gave permission to open the box. The rubber speaking tube for making records had hardened with age, and the electrotype matrix for an early record had turned green. When the original record was played the voice fifty-six years old said clearly: "There are more things in heaven and earth, Horatio, than are dreamed of."

Crowd Sees Parade in Mirrors Held Overhead on Canes

Everyone can't have a "front seat" at the curb when the parade marches by, but



Mirrors mounted on poles overcome the handicap of a "back seat" on the sidewalk when parade goes by

those in back can see the show with mirrors. Hand mirrors will do, but it's easier on the neck and arms to use a mirror fastened to the end of a cane or stick.

Inquiries as to makers of articles described in Popular Mechanics will be answered by our Bureau of Information upon receipt of return postage.

Rubber Strip in Pavement Takes Up Expansion

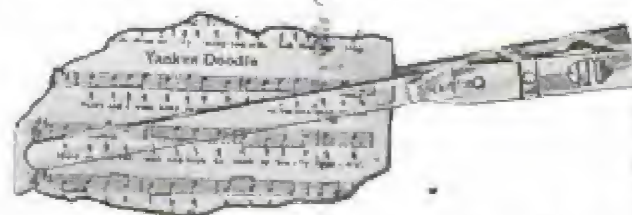


Laying the rubber expansion strip in joint of pavement, and closeup showing its moisture-proof design

Rubber strips are now being used to seal joints in street and highway pavements. They allow for expansion and contraction due to temperature changes, and keep moisture from penetrating the joints. The strips are easily applied and economical.

Transparent Music-Sheet Clip Makes All Notes Visible

Made of transparent material so that all notes may be visible, a new clip may be attached anywhere on the music sheet



All notes on the sheet are visible through this handy transparent clip

without interfering with the musician's vision. Heretofore music clips were made of wood or metal, necessitating care in attaching to avoid covering some notes.

ref. L. A. Elington
3 2 3 4 34 D. Heuser

Giant Shorthand Characters Are Latest Aid in Teaching



Flashing the shorthand characters, in enlarged form, before outdoor class. This method is said to speed up school work

Helping to teach outdoor shorthand classes, giant characters are displayed to classes for a few seconds in a novel visual education method. The demonstration involves a simplified shorthand which some educators believe may become a universal writing method. The simplified writing is based upon the corresponding longhand letters but utilizes only sufficient characters to serve as a memory guide.

Rubber Cap for Impact Tools Reduces Danger and Wear



Protection against flying chips is provided by molded rubber caps for the heads of sledges, mauls, chisels and other impact tools. In addition to the safety feature, the caps reduce re-dressing and replacement costs.

One test by a railroad showed that the capped tools could be struck three to ten times more blows than those not so equipped. The caps are made in a variety of sizes for precision fitting.

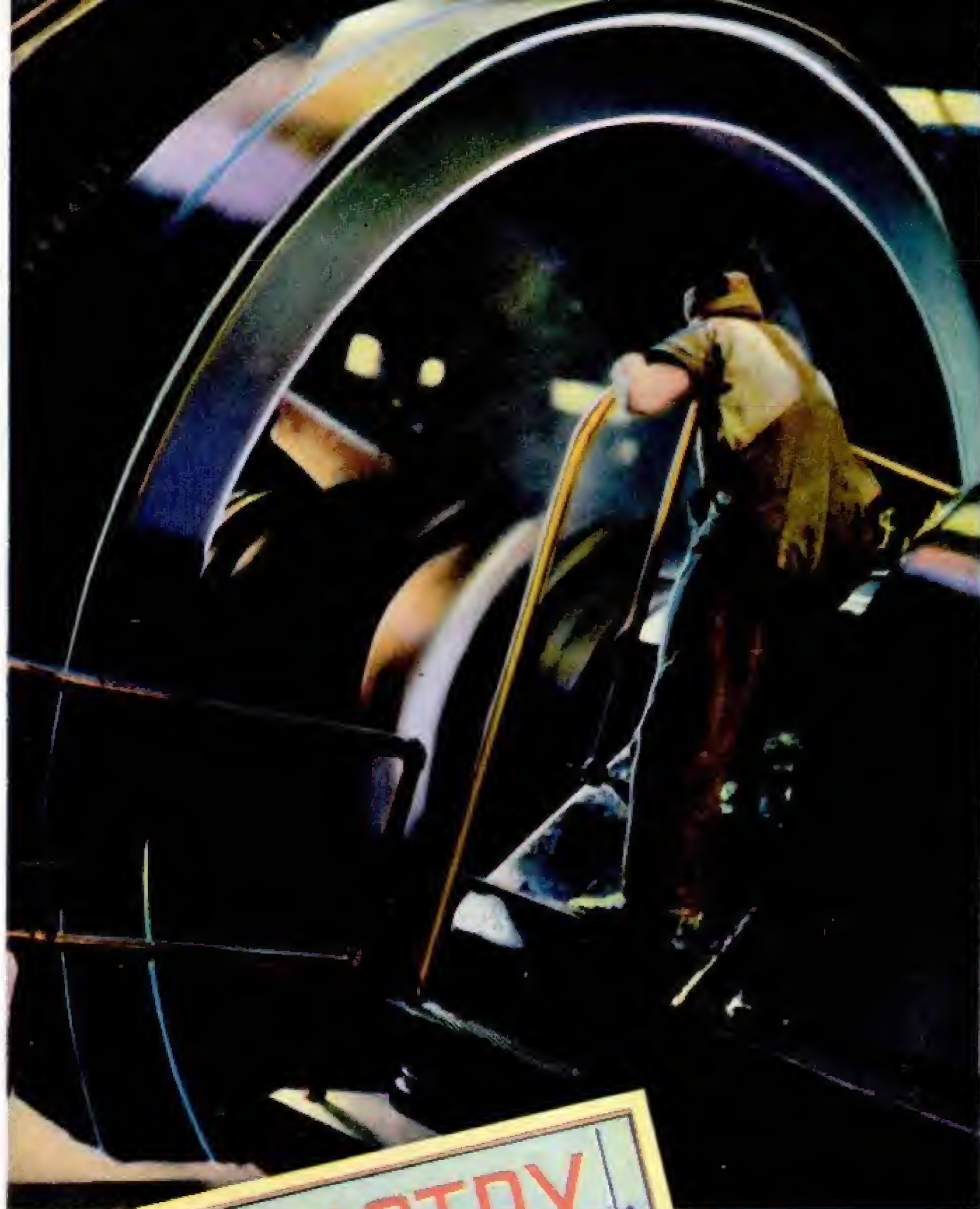
Curve Meter Aids Engineers in Road Survey

Engineers surveying California's highways have designed special instruments to speed up the task. These instruments, mounted in lightweight automobiles, gather data as the cars are driven along the roads. One of the instruments, called the curvometer, measures the radii of horizontal curves. A half circle of plywood, with calibrations to show degree of curves, the curvometer

has the same diameter as the car's steering wheel. Another instrument is the superometer and gradometer for determining the superelevation on curves and measuring the rate of per cent of grades. Information gathered with the instruments will be used in planning new roads.



Curve meter mounted on dash aids engineers in surveying California highways



es
8/11

4

CHEMISTRY and YOU

PART 2

ONE of a battery of huge gas compressors in an ammonia plant. Today nitrogen is extracted from the air and fixed directly with hydrogen to form ammonia.

es 811



DEMONSTRATING the durability of a synthetic resin finish by subjecting it to temperature of "Dry Ice" and then to boiling water.

By Dr. C. M. A. Stine

Vice-President E. I. du Pont de Nemours and Company

Wilmington, Del.

THE textile industry is literally being made over with the aid of chemistry. Its sensation, of course, has been rayon. As late as 1910 no rayon was made in this country. As late as 1925 it was looked upon as a poor imitation of silk and its faults were many. Today rayon stands on its own legs as a unique new fiber, with a yearly consumption more than four times that of silk and more than half that of wool. Most of its Cinderella-like transformation dates from 1930.

The chief fault of all natural fibers is that their quality varies with climate, season and state of health of the producing animal, insect or plant. Then, too, man has practically no control over the length, strength and size of fibers grown on a sheep's back, or produced from the soil or spun by a worm. These two facts limit the range of fabrics that can be fashioned from natural fibers. On the

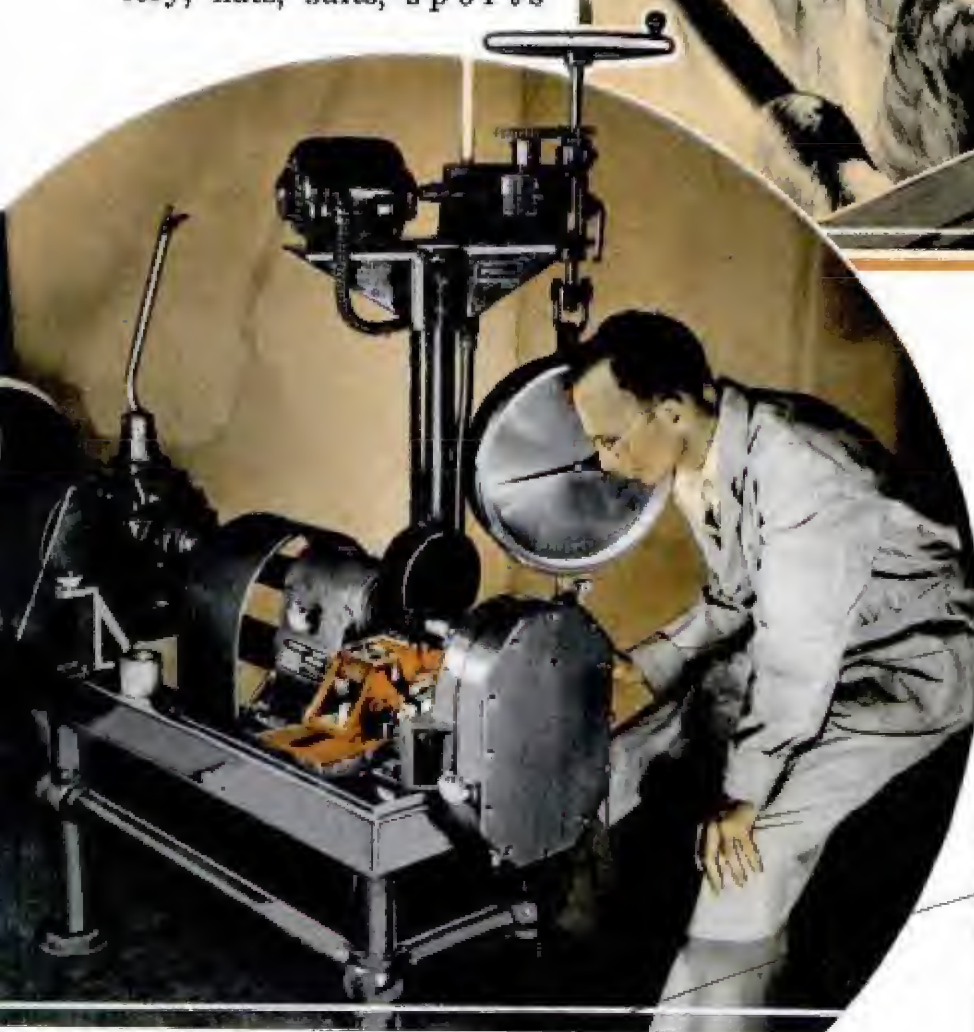
other hand, rayon is mechanically produced under rigidly exact scientific control. Its quality may be maintained uniformly year in and year out. Its filaments may be made even finer than those of silk, or as fine, or heavier; they can be made of any desired degree of luster or dullness, can be short or long, rough or smooth, or even alternately thick and thin. No other fiber has such versatility or can be changed so readily, with the result that rayon's possible range in fabric-making is almost unlimited.

The smart modern woman little realizes her dependence on rayon. It has become a dominant material in textiles, indeed is setting new higher standards for all dress, drapery and upholstery fabrics. The finest of transparent velvets are made of rayon. It may be found in the costliest creations of Paris, because in no other fabric can designers achieve such a wealth of original effects. Two



years ago a survey of gowns worn at one of the most famous of New York City's balls revealed that ninety per cent were of rayon, wholly or in part. Rayon is being used in men's lightweight suits and widely for men's coat linings. In this unique material man has mastered many of the most important elements required for the perfect yarn, and rayon's future is limited only in so far as the field of scientific research is limited.

However, chemistry's contribution to the textile industry is going far beyond rayon. The sheerest of dresses may now be rendered water-repellent and spotproof, and so may hosiery, hats, suits, sports



RUNNING test on extreme-pressure lubricants, developed through the wizardry of the chemist. Above, inspecting rayon, a man-made fabric produced by chemistry.

clothing, and in fact most fabrics of silk, wool, rayon, linen or cotton wherever used, as in awnings, tents, the outer covering of mattresses and in window drapes. The waterproofing chemical is applied to the fabric in a single operation, whereupon it becomes an invisible and odorless part of the fabric itself, shutting out water but not air. Raindrops run off without wetting the fabric.

Wrinkleproof fabrics for shirts and dresses, fabrics that stay "starched" without restarching in the laundry, others that will "hold a crease" in daily wear, and still others for use in home furnishings that are fire-retardant are already on the market or soon to be

Soldaire - Everfast Fabrics, Inc. de New York, N.Y.
under - E. du Pont
de Nemours & Co. Fine

See Sec 1937-815



A RESEARCH worker in the General Motors plant intent on solving a chemical problem. The work of such men results in the year-by-year improvement of the many kinds of metal, the fabric, the glass and the other materials which make up an automobile.



12 introduced. A wealth of new dyes, wetting agents, detergents and kindred textile assistants has been evolved, the general purpose of which is improvement of quality, and new comfort, beauty and new utility, all at less cost both to producer and consumer.

It is well to emphasize the all-prevalent creed of the new chemistry, which is to give more for less. You see it at work in the shoe industry, in textiles, in motor cars, wherever the science is applied. The practical result is a steadily growing distribution of wealth in terms of usable things; not alone the production of two blades of grass where one grew before, or perhaps where none grew at all, but production of two at the cost of one, a feat in economics that chemistry is fast making a commonplace.

Business depressions lower prices temporarily, usually at the cost of employment and profits and often of quality as well. Chemical science aims to lower prices permanently, and to keep on low-

ering them, even as it creates more opportunities for work and insures a fair return to the labor and capital concerned. In every store in the land today you find manufactured goods that are superior to those of five or seven years ago, or that did not exist five or seven years ago, and if you will compare prices, you will find that in most cases those of today are substantially less than you once paid for inferior articles of the same kind, if you could buy them at all.

Fluctuations in the costs of raw materials affect retail prices, of course, but the present phenomenon in retail prices is not a mere passing phase of our economy brought about by low raw material costs; nor is it the result of sweating labor. It is a fundamental change, fostered by man's own ingenuity in creation, that points a way to an ever better and more



HARVESTS such as this would be impossible today, except for the fertilizers supplied by chemistry. Below, pigments developed by the chemist give this bathroom its colorful appearance. Note the hand-cut inset of the seahorse in the linoleum floor covering to give a marine atmosphere.

Lower photo courtesy Congoleum-Nairn, Inc.



Kearny, M J



DYESTUFFS made from coal tar and some of the uses for the dyes are shown in this exhibit at the New York Museum of Science and Industry.



A RUBBER "tree" made of metal, part of the du Pont plant which produces "Neoprene," a substance with many of the physical properties of rubber.

14 abundant life. And it is change that has come to stay, for it is rooted in a scientific creed that does not admit the word retreat.

No less than shoes and textiles, the rubber industry has been revolutionized by chemistry. Indeed in no other industry is the influence of chemistry more marked. Recent tests of automobile tires made by a governmental agency and published by the Consumers' Union show the useful life of the best-made tires to be well in excess of 25,000 miles. When these mileages are compared with the three-to-five thousand miles of haphazard travel furnished by the tires of war-time, which cost from two to three times more and were only about half the size of modern tires, we can appreciate the extent to which tires have been improved. And rubber in all of its more than 30,000 uses has been similarly improved, with the chemist leading its amazing advance.

One of the several shortcomings of rubber is its susceptibility to oxidation. In

its natural form it rapidly deteriorates on exposure to air, particularly in the sunlight, and loses its elasticity. Nature did not put latex in the rubber tree for us to use in making rubber boots, hot-water bottles, tires and garden hose. The latex is in the tree to provide it with a means of healing wounds inflicted by insects and other enemies. As such it is a perfect material, but like so many materials satisfactory for nature's purposes, rubber must be altered to suit it to the artificial purposes of man.

Goodyear's process of vulcanizing rubber improved its strength and elasticity,

and enabled it to resist wear within limits, but the process consumed from three to four hours. The chemist set out to reduce this time by the use of chemical agents known as accelerators. Finally he found ultra-accelerators that made vulcanization possible in three minutes or less, and which simultaneously increased the strength, elasticity and abrasive resistance of the finished rubber.

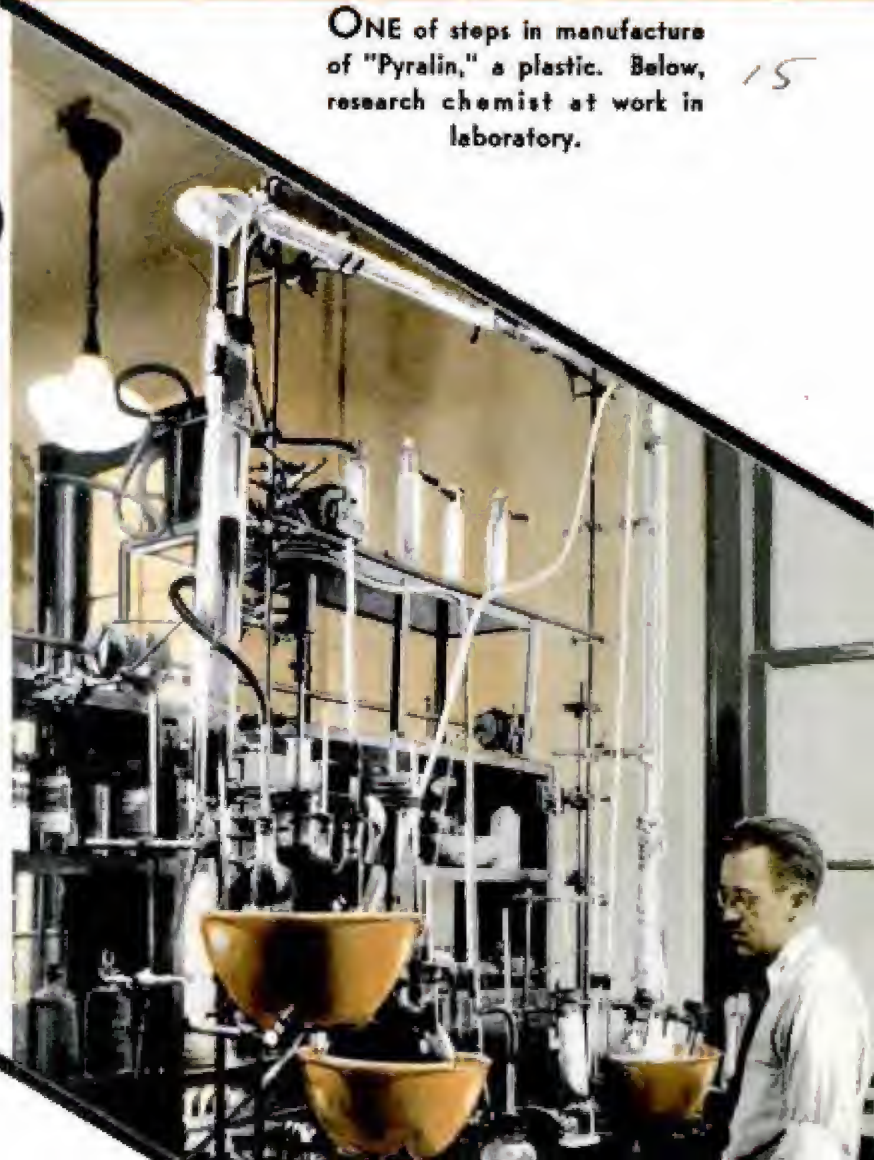
Anti-oxidants were introduced that further extended the life of rubber by inhibiting oxidation and cracking caused by flexing.



ONE of steps in manufacture of "Pyralin," a plastic. Below, research chemist at work in laboratory. 15



PLASTIC materials used in Hudson car, including wheel, ignition parts, timing gear and washers, interior fittings and radiator ornament.





SPRAYING to reduce the damage of codling moths in a Pennsylvania apple orchard. Chemists are constantly searching for better controls for insect pests.

The cotton fabric used in tires was improved. So tough was crude rubber when it reached the manufacturer from the plantations that it had to be masticated in heavy machines until it was plastic enough to be compounded. Chemical plasticizers were developed, a very recent contribution that is another step toward more economical production.

The rubber in common use today is a much superior rubber to that of five years ago, and incomparably superior to the rubber of twenty years ago, but it still has certain deficiencies. It disintegrates when in contact with oil, grease and gasoline. It still falls victim in time to oxidation. In the automobile, where it is most extensively used, it falls short of the ideal of all earnest engineers, which is a motor car wherein every part, as in the deacon's one-horse shay, will serve throughout the car's life without need of replacement.

(Cont. to page 132-A)

Cloverleaf Traffic Circle Covers Big Garage



Under traffic circle at left of the superhighway, is a garage with accommodations for 250 automobiles. Cloverleaf intersection at Seventy-ninth street is part of Manhattan's \$24,000,000 water-front project

Beauty, utility and safety are combined in New York's new superhighway, part of a \$24,000,000 improvement project on the Manhattan west side water front. The clo-

verleaf traffic intersection at Seventy-ninth street includes a huge fountain, and a yacht basin and promenade are yet to be built. Beneath the traffic circle is a garage.

Motor Sled Hauls Ski Party by Cables to Peak of Slide

Tobogganing uphill makes skiing downhill more pleasant for winter sportsmen in

Yosemite National Park. A motorized sled— they call it an "upski"—takes ski parties

up the 3,000-foot slope to the top of the ski run. The upski is really two passenger-carrying sleds, mounted ahead of and behind the ninety-five horsepower truck motor which is on a center section. Traction is furnished by two fixed cables counterweighted at the bottom, and the sled is protected by safety devices which would go into operation if a cable broke or the motor stopped. The sled, fifty feet long and weighing two tons, carries thirty-two, and makes the uphill run in five minutes.



Double sled with motor at center hauls ski parties in Yosemite Park

Badger Pass Ski Area

ent. 11/48
Long Beach
California
Yosemite
National Park
California

Es 1103 Eastman Kodak Co,
Rochester, N.Y.

How To MAKE

Here are some clips from home-movie reels. They should remind you to keep your lens focused on the center of action—and if you must “panoram,” do it to follow a moving object such as a football run. Then your audience watches the player and doesn’t mind the blurred background



Learn the difference between mere animated snapshots and a movie.

When you start taking motion pictures you are a step ahead of the old snapshot days when you merely pushed a button and “took down” a scene to be pasted in a book. Later you would show the pictures

IN HOME movies it's change of pace, or what the professionals refer to as “tempo,” that wins.

Ten seconds is the rule for a scene, but learn when to break the rule.

Steal the stunt of the candid cameraman—catch your actors off guard. “Panoram” almost never—but when there's action to follow, forget the background.

Mix things up. Mix action with calm, mix landscapes with personalities, mix close-ups with distant shots.



Good HOME MOVIES

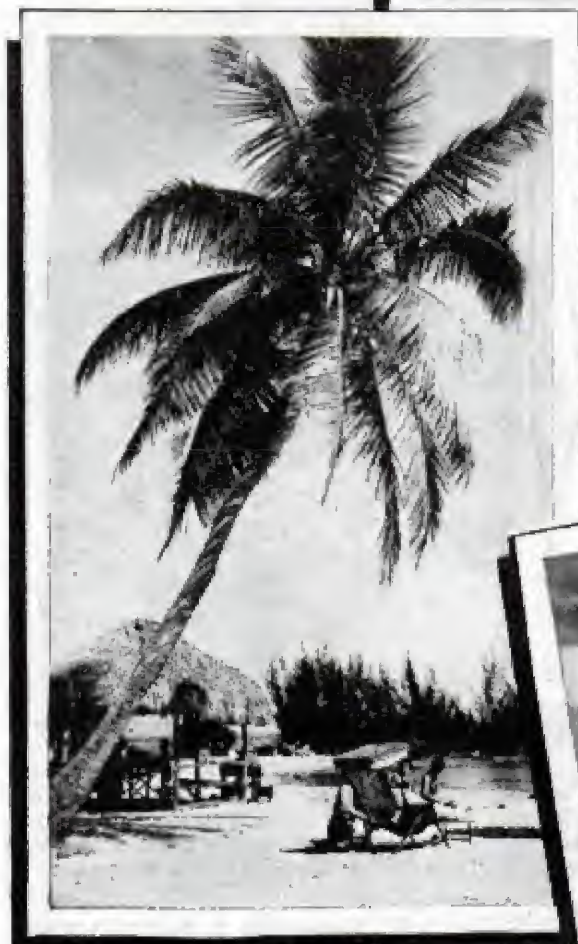


Close-ups count in movie making—close-ups of action and people. Nothing can catch the quick-changing expressions on a child's face so well as a movie. Let the figures fill the view finder

Let's use for example a simple and popular picture subject such as a boy and a new bike. A snapshot record of the prideful youth and his shining steed would, perhaps, be merely a shot of him about to shove off for his first ride—and probably very conscious that he is being filmed in the act. Maybe several snapshots, until you feel you've gotten the "right" expression.

A movie, however, need not and should not be posed. It should not be one, two, or a dozen shots of a "boy with bike"—it should tell the story of the boy and that new bicycle. Each new shot should logically elaborate upon its predecessors so that your movie audiences will see, among other things, the pride of the lad in his new acquisition; cautionings from his father on its care; adjustment of seat and handle bars; demonstration of the use of the brake; learning the importance and location of oil caps; the first careful ride; growing skill; daring acrobatics; inevitable spills. It should be composed of shots made at many different distances, different camera angles—up-

to your friends and explain the Who, What, Where and When of each snap. Movies tell their own story. Of course you can title them—but that is incidental. Every "take" of a parlor movie should be part of a continued story. Even silent movies can "talk."



Dreamy tropical scenes and quiet landscapes call for longer exposures. Your audience wants time to take in details. Hold the camera steady—let swaying palms or drifting clouds furnish action in pictures like these

wards, downwards. It should be filmed in sequences with continuity. For, although both movie shots and snapshots are made singly, the former are shown successively. Which, alone, implies that they will tell a story, a story with a logical beginning and a logical ending. There need be no acting, no posing, no props, no staging or make-up. Yet it's every bit as much a movie as the most colossal "Colossal" ever born of Hollywood. It's just as easy to make as a collection of animated snapshots. And its simple, obvious technique is equally applicable to the filming of every subject.

Many movie beginners, yet to grasp the fact that movies should be taken with their projection possibilities in mind, seek to "needle" their animated snapshots with camera tricks to stimulate interest.

The most popular and unnecessary is the panoram. While it is true that panorams are possible with any movie camera and clearly beyond the realm of snapshot making, wherein lies their chief charm, they should be studiously avoided. If for no other reason than that they prove distracting on the screen. A lovely garden; a charming landscape; an imposing structure—the desire is to "get it all" in one shot. Hence, a panoram, generally a fast, unsteady panoram, and the desirable subject matter, projected on the screen, whizzes groggily past the eyes. Its beauty is lost in distracting jumpiness.

(Continued to page 116A)

Modern Tower Replaces Old Building's Dome

Restyling of an old fourteen-story building in San Francisco has resulted in replacement of a large dome with a setback tower which increases the height to twenty-one stories and adds almost 100 offices to the rental space. Since lightweight steel was used, the tower's weight was held to that of the dome, making it un-

Claus Spreckels



Top, the old building in process of remodeling. Bottom, architect's sketch of same building after it had its "face lifted"

necessary to reinforce the foundations or original framework. Specifications called for replacing the old elevators with modern high-speed cars, each equipped with automatic door-closing and floor-leveling devices and latest safety features.

Use of Steel for Elevated Highways Calls for Increased Production

Increasing use of steel for building elevated automobile highways throughout the country will call for heavily increased steel production a decade from now, engineers predict. Other cities are expected to follow New York in solving traffic problems by constructing express highways on steel stilts with cloverleaf underpass systems to

make intersections safe. Production of steel is forecast at four and one-half billion tons by 1947, a billion tons more than at present. Much of that steel will be going into skyscrapers and railroads, bridges, homes and ships, machinery and automobiles as in the past, but the future will see more steel used in double-deck roads.

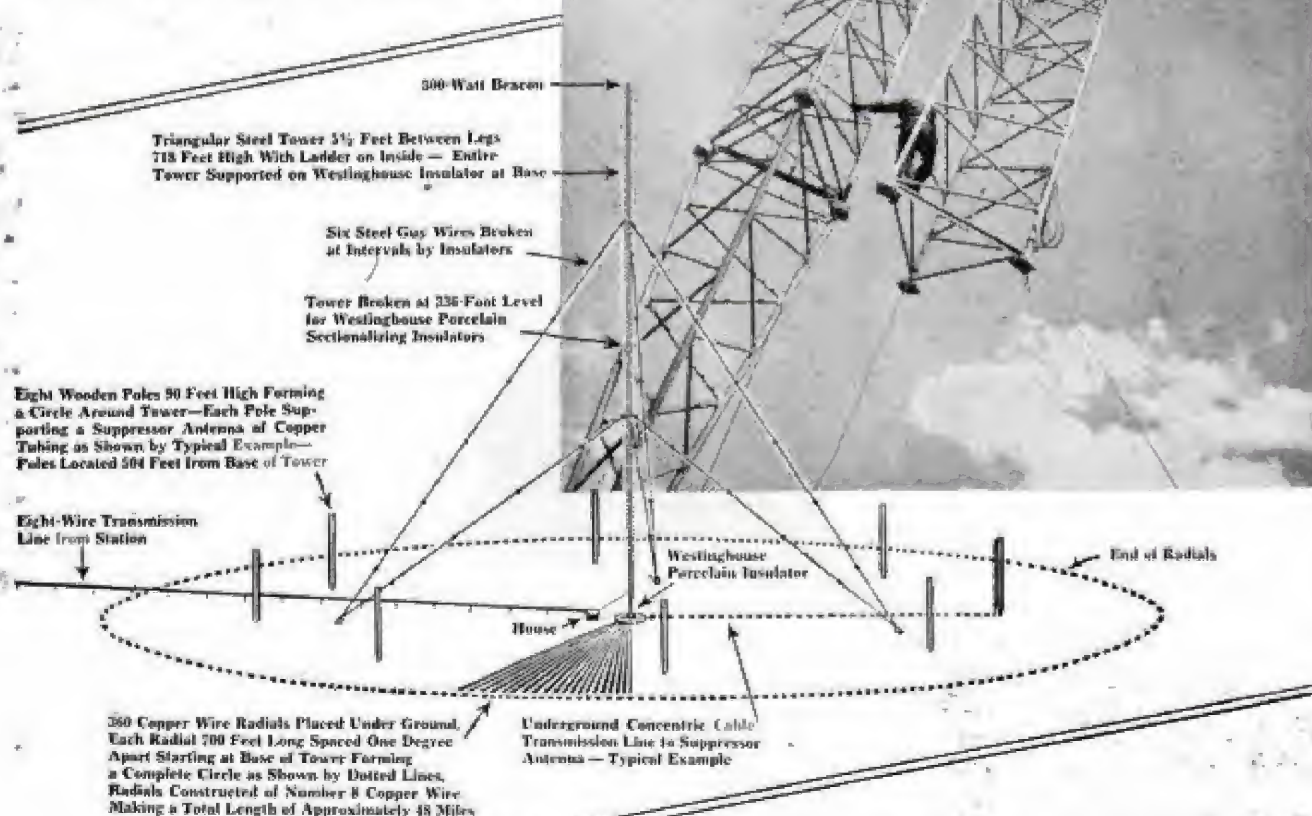
at convention of American Institute of Steel Construction. 200

Scene Source 10/26/37

Cont. William W. Weir 576 6' James St. San Francisco, Calif.

718-Foot Antenna Improves Radio Programs

Vastly improving broadcast service, a 718-foot steel spire antenna is being used by KDKA, the Westinghouse station, to reduce signal fading. The spire, operating inside a circle of eight ninety-foot antennas, gives primary broadcasting service over an area ten times greater than that previously provided with strong, clear signals by the old equipment. Vertical antennas, of the type used in the new system, radiate both ground and sky waves. When the two waves meet in areas of varying distances from the station they interfere with each other, causing



Top, section of lofty antenna being hoisted. Bottom, sketch of antenna system designed to improve radio broadcast service

fading or "mushy" program reception. The shorter antennas also radiate sky waves but in opposite directions to nullify the effect of the sky wave emitted by the main antenna. So high that its top half frequently is obscured by clouds, the spire is composed of thirty-two three-cornered welded steel sections. Only five feet wide, these sections are bolted together. Two

sets of long guy wires hold the antenna upright. The sixty-ton structure rests in the ball-and-socket joint of a single large porcelain insulator strong enough to support the weight of the steel and the twenty-ton additional load imposed by the pull of the guys. About halfway up the spire, three smaller sectionalizing insulators have been inserted to break the antenna,

electrically, at a height of 336 feet. Insulators inserted in the guy wires eliminate radiations from this source and the conducting of current to the ground. Thus, completely insulated from the ground, the spire becomes charged with static during storms, then crackles and sparks continuously, but its broadcasting efficiency is not affected. To improve the conductivity of the ground around the antenna, fifty miles of copper wire have been buried one foot under the surface, radiating out, one degree apart, for 700 feet. Data included in the design of the antenna were obtained by tests with small blimps, sent aloft to extend transmitting wires up to 1,500 feet. It took a crew of nine expert steel riggers seventy-two working days to erect the tower. *Es 1042.*

Vegetable Shredder Saves the Hands

Designed to eliminate injury to the user's hands, a vegetable shredder and slicer has a trough in which the vegetable is inserted and pushed toward the cutter. A metal feeder makes it possible to use all of the vegetable. Various sizes of shredders and cutters may be used with the kitchen tool.



Feeding vegetable into shredder. Note that danger of injury is reduced

Ninety Eggs Graded in Minute by Latest Automatic Machine



This woman operator finds it easy to grade eggs with the aid of this machine which turns out ninety per minute

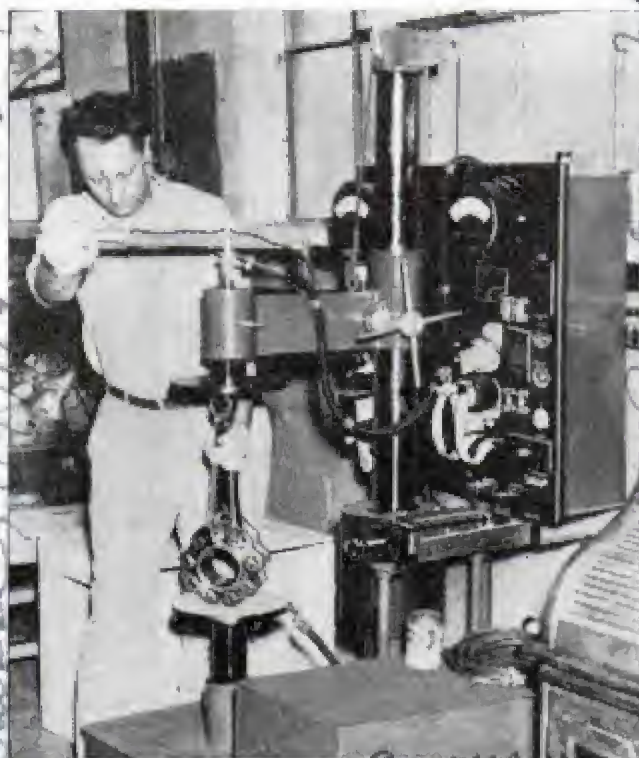
More than ninety eggs per minute can be graded in a machine exhibited recently in London. Almost as fast as the eggs can be placed on the machine, they are graded, so that more than 5,400 per hour can be handled at the machine's top speed.

Tube in Safe Prevents Robbery by Giving Off Strong Gas

Protection of a safe against robbers is afforded by a sealed tube containing a liquid that turns into a powerful gas when the container is broken. The gas affects the eyes and other parts of the body. Concealed in the safe, the tube is broken by anyone attempting to force the safe by breaking off the combination or using explosives. It is claimed the device can be marketed inexpensively.

Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information, inclosing return postage

Flaws in Airplane Parts Found by Magnetizer



Part of plane being subjected to flaw-finder in
air line's repair shop

Flaws in the metal structure of an airplane can be revealed through use of the Magnaflux, a device now in use at the operations base of one air line. The Magnaflux magnetizes the metal to be used, after which the part is dusted with metal filings. Any flaw is revealed by the line of lesion in the metal not covered by the filings.

Baby Buggy Slides Down Stair on Folding Glider Frame

Attached to the undercarriage, a folding glider frame enables mother or nurse to



Two views of carriage. Left, glider in use. Right,
glider folded against axles.

slide the baby buggy down stairs without permitting the wheels to bump on the steps. Unfolding the glider into operating position at downward angle lifts the wheels clear and the buggy remains on a level during the trip. This eliminates dangerous tipping. When the glider is not in use, it folds neatly against the axles.

Low Upkeep of Steel House Offsets High Price

Steel houses cost more than other houses but the high initial price is offset by low maintenance charges, according to F. T. Llewellyn, U. S. Steel research engineer. More than 1,400 steel houses already have been built in the United States. Envisioning a potential market of 300,000 homes using 1,500,000 tons of steel each year, the research engineer pictures homes without basements and with increased number of corner windows and larger areas of glass made possible by the use of steel construction. He points out that non-shrinkability of steel gives a more efficient structure which requires lower maintenance costs than houses constructed of other materials.

Pedal Car Made of Two Bikes and Streamline Hood



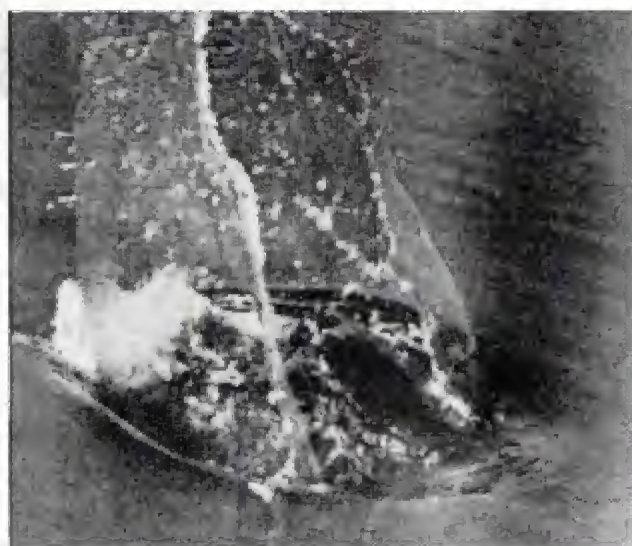
Here is the cyclomobile and the family which
makes short trips in it

Consisting of two bicycles joined together and covered with a streamline canvas hood, an odd pedal car carries the whole family in Massachusetts. While husband and wife work both sets of pedals, the baby rides in a small berth. There also is space for luggage. The waterproof hood has isinglass windows. Dry-cell batteries furnish current for front and rear lights.

Leaping Trade Fair
10 E 40 St, New York

Built and owned by
Mr. and Mrs. Aime

Fast Camera Catches Stone Striking Water

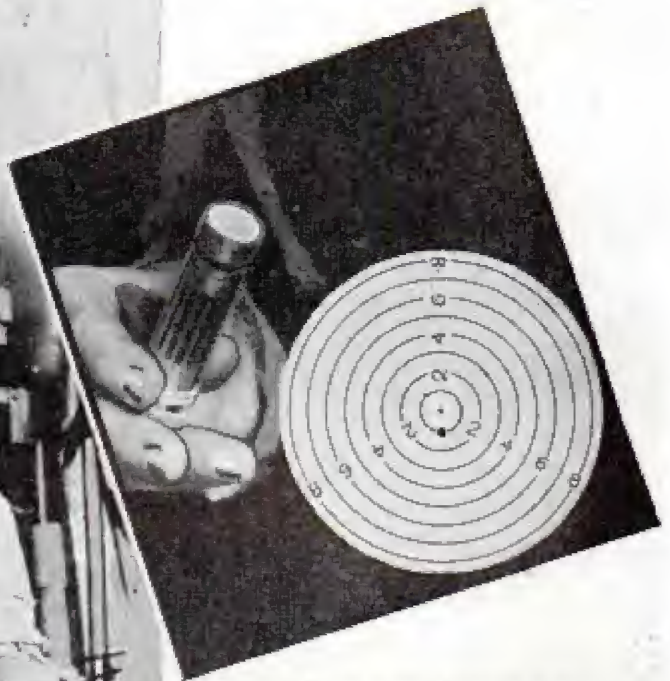
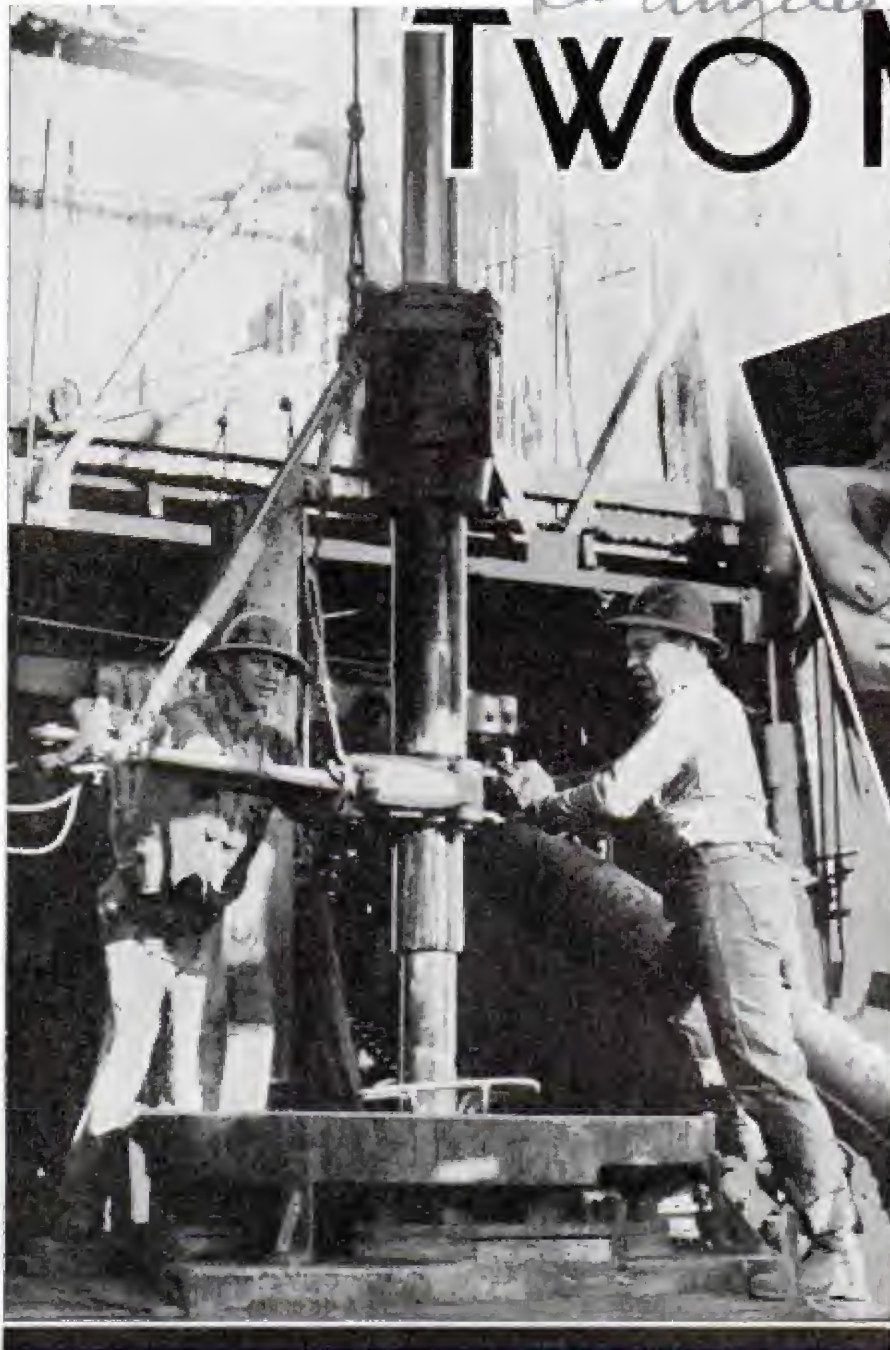


Wide World Photos.

What happens when a stone is thrown into the water at an angle of seventy-five degrees is revealed by a fast camera in a set of six photos taken recently. The action, all taking place in one-fiftieth of a second, is too fast for the human eye. In the photos above, reading from left to right and top to bottom, as the stone hits the water, it makes a crater-like depression and throws up a veil of water on both sides. Then the water rushes into the depression and sets up a small wave that is the forerunner of the familiar succession of circles. The pictures were made with a high-speed continuity camera

Es 1160 Cont Thomas G. D. L. L. L. Jr
105 55 Holman St
Los Angeles, Calif

TWO MILES



Left, drilling crew threads pipe. Right, examining paper target brought up from bottom of well. Tiny hole near center shows mile-deep well is comparatively straight

they pull out the slips that hold the pipe string and another eighty-eight feet of pipe goes down into the hole.

At any stage a single mistake by one of the men would cause a serious accident or do damage

costing a small fortune. Yet the well-trained drilling crew, working with tools that weigh from 100 pounds to several tons, moves at high speed with the sureness of a championship football team.

Five or six years ago oil operators thought they had gone as deep as they could when they drilled not much more than a mile. Today a good crew is able to push pipe farther than two miles below the surface. Stronger flexible metals for the drill pipe, taller derricks and more powerful pumps for circulating mud down the well and back are playing their parts, but more than half of the credit goes to the husky driller who stands at the engine controls. With good luck a two-mile well

PERCHED high in the steel framework of the oil derrick, the derrickman leans out against the pull of his safety belt. Up from the floor of the well ninety feet below the steel cables whisk a two-ton traveling block and elevator at thirty miles an hour.

As the block arrives, he grabs the dangling elevator link and sways it over to the top of a length of drill pipe in the corner of the derrick. In another second the elevator gate slams around the pipe and with a jerk the cables lift it into the air. Looking down, the derrickman can see the two helpers push their end of the pipe over to the rotary table, stab it into the top of the pipe sticking out of the well, and spin in the threads with the big tongs. Then

DOWN for OIL

Reference: Mr. J. H. ...
Associated Oil Co. of
Pacific Electric Bldg.
Los Angeles.
Calif.

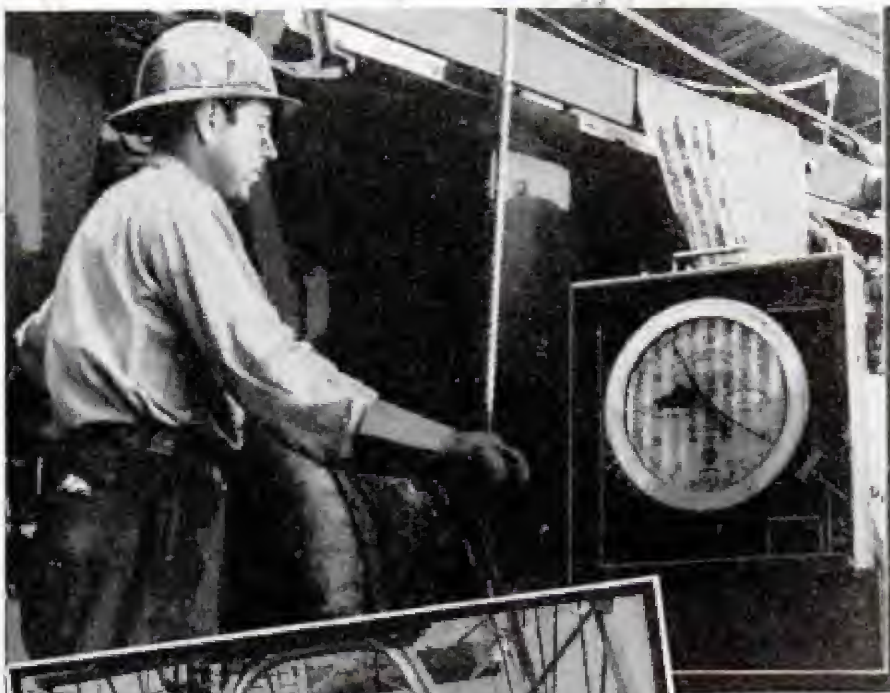


Left, night drilling scene. Right, samples of rock cut from bottom of well and brought to surface by coring machine that drops down inside drill pipe

takes nearly a year to drill. The three chief drillers, spelling each other in eight-hour shifts, never leave their post. The revolving column of drill pipe and its bit

at the bottom may weigh 100 tons but instead of being slam-bang mechanics the drillers are chosen for their great skill in handling the tools. Drilling a deep oil well is one of the most delicate jobs in the world.

If you made a model one foot high of a deep oil well the 10,000 feet or more of three and four-inch drill pipe would be about four-thousandths of an inch in diameter. That is literally the tool with which the driller works. His drill pipe bends just as easily and will go crooked



Top, driller at the controls. Bottom, derrick floor, showing traveling block and swivels that support part of drill pipe's weight

bit he supports the pipe partly by the cables so that the crunching teeth at the bottom of the hole will not bite too deeply. With a flip of his right hand he can raise the bit from the bottom or by spinning in the throttle wheel keep the bit from turning. Big dials in front of him show the weight on the bit, torque of the drilling table and the pressure under which the mud is going down the well.

Drilling a deep well is slow work and often the bit will cut through only fifteen or sixteen feet of rock per day. In hard formations the bit has to be pulled out of the well and changed once a day. It took 338 days to drill the McGonigle No. 12, an Associated Oil company well in California that held the record for deep production at 10,569 feet for a long time in 1937. The first 800 feet of that well is wide enough to stand in, and after that depth had been drilled and lined with steel casing a thirteen-inch casing was placed down to 6,000 feet, after which the well was reduced in diameter again, with the last few hundred feet of the well only four inches wide. Down at the bottom the temperature is just at the point of boiling. The steel liner casing that went into the hole weighs 528 tons. The pipe with which the hole was drilled is hollow so that a continuous stream of mud could be pumped down inside it under pressure to pick up chips and broken rock at the bottom and flow back to the surface outside of the drill pipe.

just as easily as the microscopic wire and it will twist off and break with the same ease. To control his fragile brace and bit the driller keeps one hand constantly on the lever that controls the cables supporting the 100-ton weight of the pipe string, and his other on a throttle wheel that keeps the drill pipe turning. Instead of permitting all the weight to rest on the

Technicians watch every step of drilling. They keep track of the well's straightness by various means of "taking a picture," one of which consists of lowering a tiny paper target inside a heavy steel rod down to the bottom of the well. After an interval, a time clock operates a plunger

that pierces the target. The degree that the punch mark is off center on the target indicates how far from true vertical the well happens to be.

Instead of taking time to pull the string of drill pipe out of the hole to lower a special coring tool to the bottom in order to take a sample of the rock, a small coring device is dropped down inside the drill pipe and through a hole in the center of the bit so that it can



Top, derrickman descends from lofty perch in emergency cage. Left, split section of pipe recovered at great depth by means of wall hook. Bottom, bits used in drilling deep well



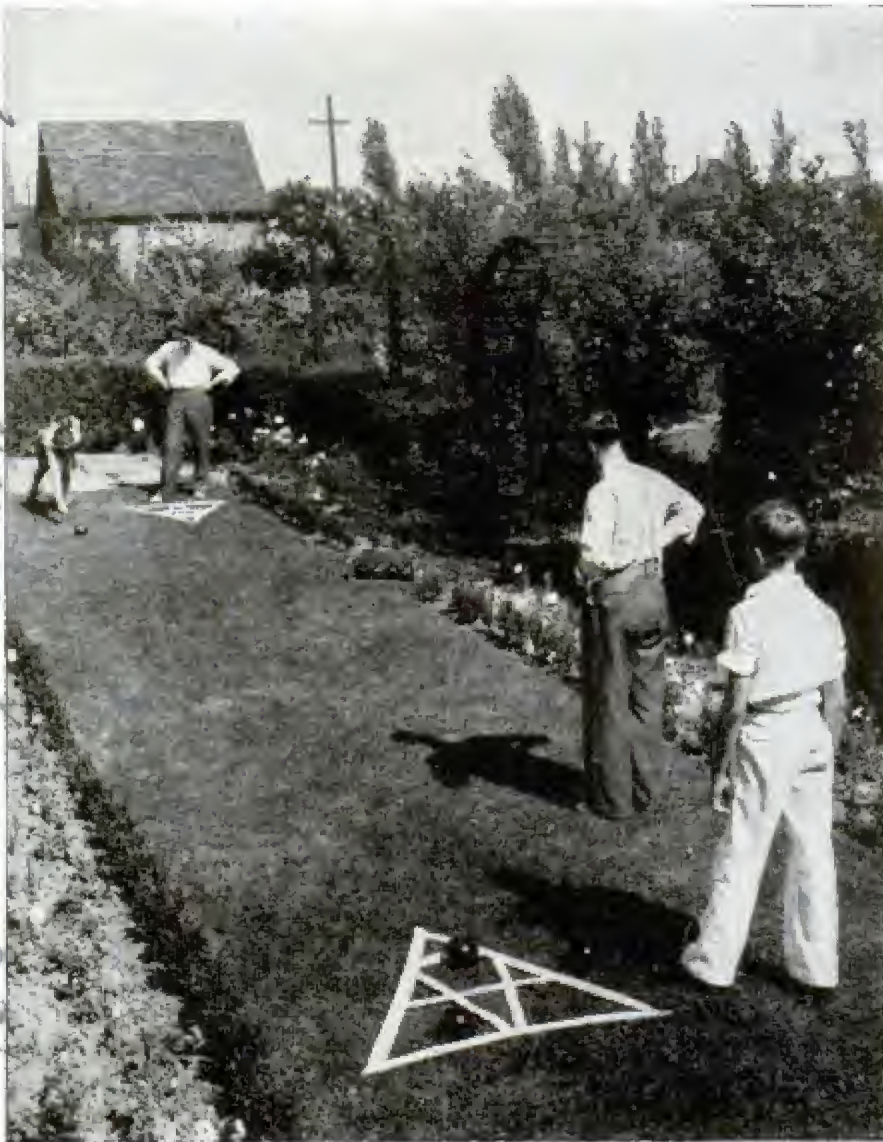
cut new rock and bring up the sample.

As a final checkup on the formations through which the drill has cut, an "electric log" draws a geoanalytical record of the kinds of rock encountered on the way down and the presence of water-bearing and oil-bearing strata. Sometimes a crew keeps on drilling after it has pierced three or four different oil sands, one below the other. When drilling is fin-

(Continued to page 146A)



Bowling and Shuffle Board Combined in Game on Lawn



Playing the new lawn game. The idea is knock opponent's ball out of target with the bowling ball which is rolled along the grass

Combining the features of bowling and shuffle board, a new game is played on the lawn. Regulation bowling balls are rolled toward a target divided into several scoring areas. The idea is to knock your opponent's scoring ball out of the target ring and leave your own in the scoring area. Each side has a target, the two being thirty to forty-five feet apart.

Sliding Thermostat Checks Gas after Enough Water Is Hot

If you want to heat only a part of a tankful of water, there is a sliding thermostat which can be adjusted to shut off the gas when the hot water reaches the level desired. It slides up and down the

tank on a cable. This method economizes on the use of gas, and also promotes safety, making certain the gas will be turned off if you forget. You can also install switches in the bathroom, laundry and kitchen to start the hot-water heater by remote control.

Electrified Map for Blind Has Braille Names

Constructed so that a blind person may feel and read the name of any town on which he puts his finger, an electric map rings to give a double check on the name. It is a relief map with the towns marked by copper tacks and the rivers by copper wire. Beside the map is a list of the names of towns and rivers in Braille, each with a copper tack in front of it. To find the name of the town on which he has his finger, the blind person attaches one contact of an electric circuit to the copper tack at that point, then runs the other contact down the tacks in front of the names. When it touches the tack opposite the right name, a bell rings.

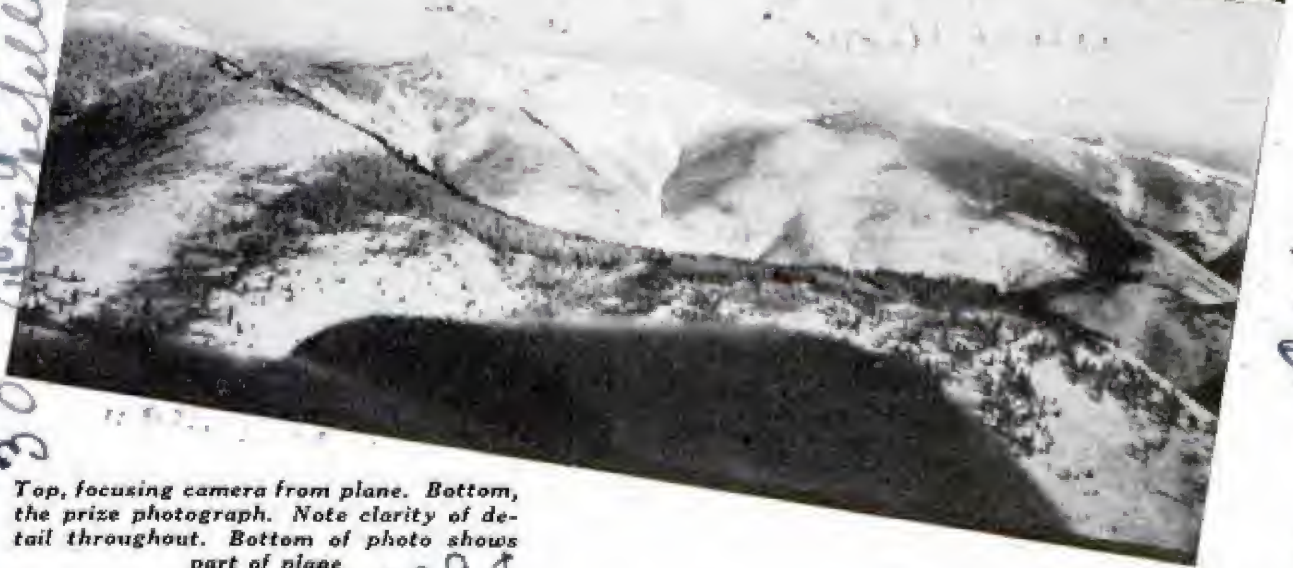


Showing how the electric map works. It rings when the proper contacts are made

Used in Norway

Prize Photo of Rockies Taken from Air Liner

Taken aboard an air liner traveling more than two miles a minute at an altitude of 8,000 feet, an unusual photograph of the Rocky mountains recently won a high award from the Photographers' Association of America. Snapped through a celluloid-covered window and with a "sky-view" aerial camera "stop 5.6 at $\frac{1}{125}$ of a second exposure," the photo shows a vast expanse of snow and fir-clad sweep of distant mountain range. The curved cowling of one of the transport's motors occupies the foreground. The prize photograph was made by Herman R. Wenner, who has made aerial photography a hobby.



Top, focusing camera from plane. Bottom, the prize photograph. Note clarity of detail throughout. Bottom of photo shows part of plane

Electric Eye Stops Ground Noise in Sound Track of Talking Pictures

That buzzing "ground noise" that has accompanied talking pictures to the great annoyance of sound engineers is being curbed by the "electric eye." An inventor has discovered a way to make the silent portion of the sound track really silent, using a set-up of three photoelectric cells. Sound is recorded on film by picking it up with a microphone, which converts it into varying electric current; this current op-

erates a lamp which makes a record on the sound track. When the films are projected the process is reversed. The entire sound track is not filled with sound at all times, and the black portions should be silent. But sometimes diffusing light leaks onto the silent portion and causes a low tone. The inventor arranged electric eyes to operate a shutter covering the "silent" portion of the sound track, preventing leakage of light.

Patented by Edward W. Kellogg
Newark, N. J.

Assigned to Radio Corp. of America
30 West 42nd Street, New York

evening 10/26/37

10/26/37

Television Breaks into Films with Broadcast from Studio



Sailing Along

Cast of musical show being filmed at English studio gathers around television camera which broadcast "preview" while movie was in production

© Planet News, Ltd.

Television invaded the movies in England for the first time recently. The television camera, its tripod mounted on a rubber-tired truck, was brought into a film studio in Buckinghamshire during the making of a new musical picture, and a view of the studio action was broadcast on an afternoon television program.

Cornea of Eye Is Tattooed to Improve Vision

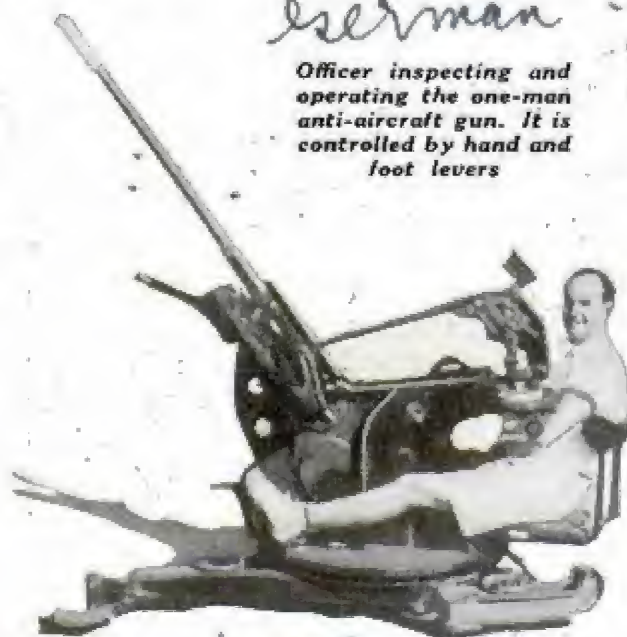
Tattooing the cornea of the eye with gold and platinum to improve vision is one of the recent additions to surgery which have proved valuable, according to Dr. Ramon Castroviejo of Columbia Presbyterian Medical Center. This form of eye surgery dates to the second century A. D. when Galen used a hot iron rod, powdered pomegranate bark and copper salts to make indelible coverings for opaque spots on the cornea, which is the transparent layer that forms the outer layer of the eyeball. When superficial opaque spots de-

velop on the cornea, especially near the pupil, they greatly interfere with vision, Dr. Castroviejo says, by dispersing the light that passes through the translucent area. Tattooing closes up the spaces between the opaque spots and allows light to pass through a concentrated area. Gold was first used in 1911 and platinum in 1928. The metals, in the form of chlorides, are used in a solution which is placed on the opaque spot for two or three minutes. Then adrenalin chloride is added and the gold changes chemically so that a dark brown, almost black, coloring is produced.

One-Man Weapon to Fight Planes Is Tested

Secret tests of a mysterious anti-aircraft gun are being conducted by foreign officers serving with the Spanish insurgent forces. A one-man weapon, the gun can be operated at almost any angle, elevation being controlled by foot levers and direction by hand. It is regarded as an important development in defense against airplanes.

Officer inspecting and operating the one-man anti-aircraft gun. It is controlled by hand and foot levers



Pinewood Studios

Broadway and 168th Street

described at meeting of American College

Scouting Warplane Hangs Report on Wire

When Japanese warplanes operating in North China return from a scouting flight, they report by hanging a cylinder on a cross-wire in front of headquarters. The plane flies low, the cylinder dangling at the end of a wire, and the pilot hooks the cylinder wire across the ground wire. Then he flies on, making it unnecessary to report after bringing the ship to the hangar. The cylinder contains a report of observations on the flight, enabling headquarters to speed up operations against the enemy.

Japanese warplane preparing to fly over cross-wire on which it will hang scouting report



Railway Crew Called to Rescue Cow from Quicksand



Suzanne, the farthest north cow in Manitoba Province, got in too deep one day and it took a railway wrecking car to hoist her out of quicksand

Rescuing cows is scarcely the regular line of duty for railway wrecking crews, but Suzanne, the farthest-north cow in the province of Manitoba, Canada, is very grateful to a Canadian National Railway crew. Suzanne supplies milk for some of the residents of Gillam, Man., a small town on the Hudson Bay railway. She went for a stroll one day along the right of way, slipped and got stuck in quicksand surrounded by muskeg. Pulling her free was too big a job for men. Suzanne was in too deep and nothing could save her but the power hoist of the wrecker. The railroad sent it out promptly and the big hook lifted her to safety.

Canadian National Railway?

es 1081 Mr. Thomas G. Bennett Jr.

16565 Holman Av
Los Angeles, Calif

DARE-DEVIL

Reference: Vance Briggs Bennett Airplane
San Fernando, Calif



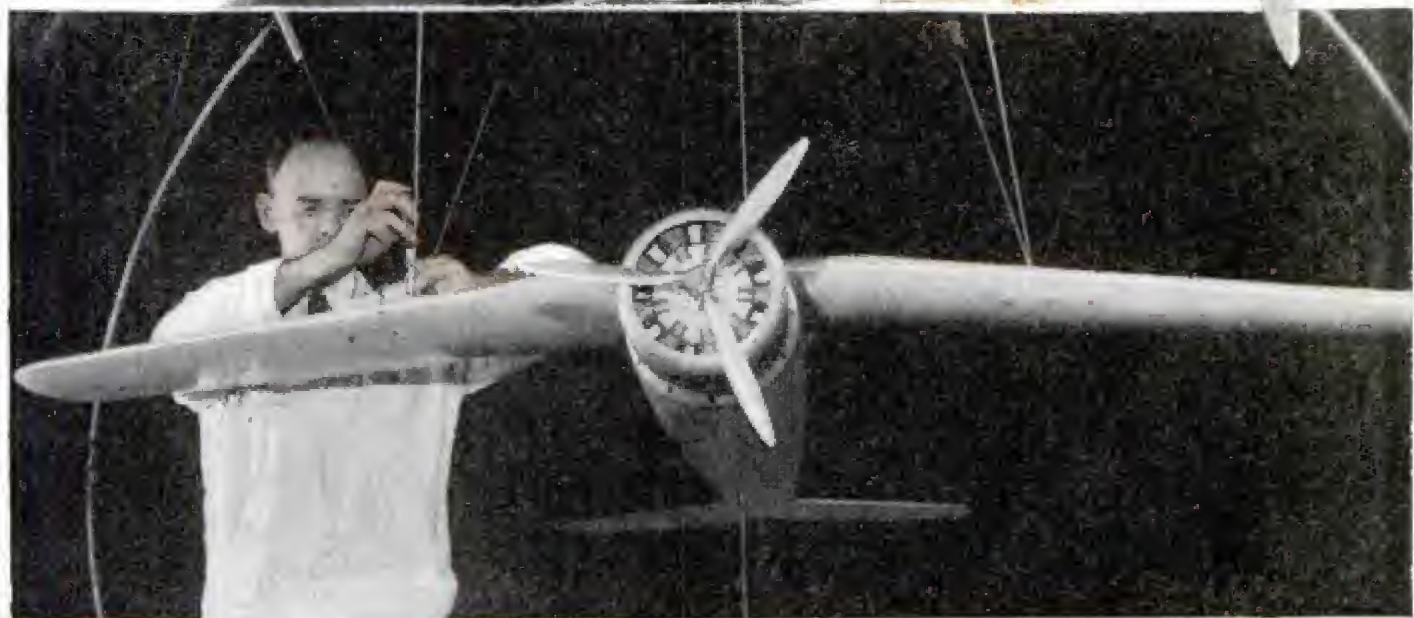
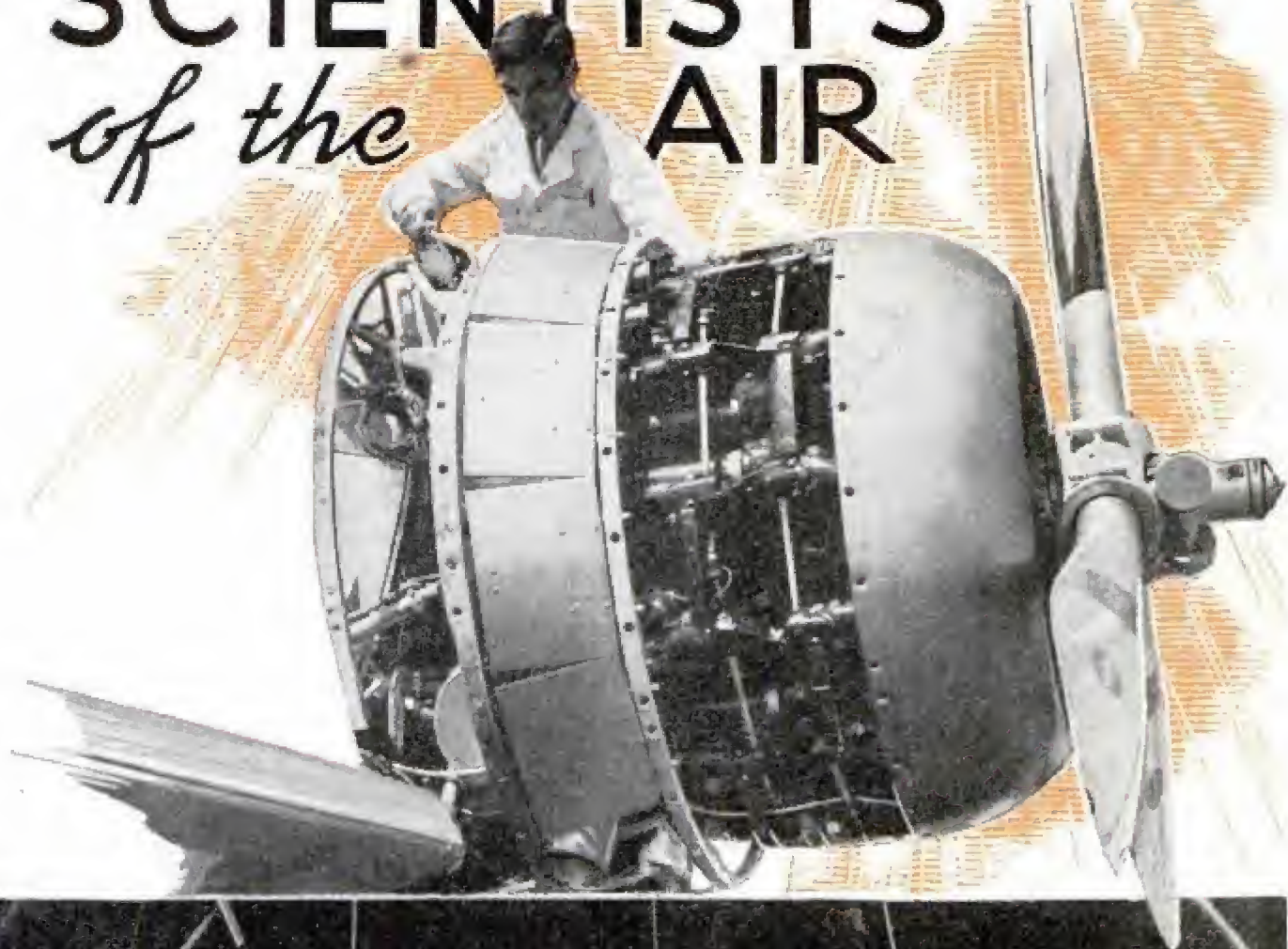
THE strangest scientist in the world sits tipped over in a padded chair diving toward the earth at 500 miles per hour. Instead of watching test tubes he glances at rows of flickering instrument needles. Instead of a desk he uses a writing pad strapped to his knee. His laboratory is one of the latest experiments in fast fighting planes.

His 1,150-horsepower engine is heard miles away and spectators hold their breath. But instead of wondering whether he should jump while there still is time the scientist calmly goes on with his work. Starting his dive four miles above the earth, he has less than twenty seconds in which to note and remember readings of more than a dozen instruments.

Then, at the bottom of the dive, with a tremendous yell to constrict his stomach against the strain, he tilts up the nose of the plane for a crushing pull-out. His body begins to prickle as if it were going to sleep. Right now his weight is more than half a ton and

Top, seven and one-half ton Lockheed leaving for test. Bottom, leaving cockpit after 19,000-foot dive in fighting plane

SCIENTISTS *of the* AIR



Top, mechanic giving twin-row engine final inspection before test flight. Bottom, preparing for wind-tunnel test of a new model plane

his leaden fingers can barely operate the stick. But he still has to watch and remember the stories that the accelerometer, the thermometers, and the other instruments tell.

Aviation has replaced the dare-devil test pilot of ten years ago with a scientist who takes up a new fighting plane and finds out

exactly what it will do. Even death-defying terminal velocity dives, spins, and flat pull-outs are reduced to cold, mathematical performances.

A pilot rarely allows an airplane to work up to its full velocity in a dive because of the strain on the engine. To slow down he opens the throttle wider. He actually puts



struggle out against the air blast, and fall up," one test pilot says. "A pilot who is able to leave a diving plane receives the sensation of falling up because the plane drops away from him the instant he lets go. He starts to lose speed at once but the plane flashes on. Right then the best way to commit suicide would be for him to open his life-saving parachute. He must wait long seconds until the cushioning air slows him down to half his original speed. Otherwise the terrific slam of the air against the opening parachute might shred it to rags."

Abandoning his ship is the last thing a test pilot wants to do. Sometimes he must, but a new design often represents an investment of a quarter or a third of a million dollars. If anything happens he tries to get it down safely. The cause of a failure would be hard to find if the plane is wrecked.

Often a competent pilot is able to observe a threatening failure before it actually disables the plane. A vibrating wing panel, a tendency toward aileron flutter, or a slight jerking of the controls will make him ground the plane until changes are made and it is ready for tests at higher speeds.

The half dozen top-flight test pilots in the

IN FLIGHT (Check following items thoroughly and record full details)
 ENGINES:—Climb at rated horsepower at optimum indicated air speed to engines critical altitude.
 Outside air temperature at critical altitude 14 deg. C.

	LEFT ENGINE	RIGHT ENGINE
Gasoline Pressure	4.2	4.4
Oil Pressure	80 lbs.	82 lbs.
Oil Temperature	60 deg. C	63 deg. C
Manifold Pressure	32" at 8000 ft	32" at 8000 ft
R.P.M. at Full Power	2250 at 8000 ft	2260 at 8000 ft
Carburetor Air Temperature	35 deg. C	55 deg. C
Head Temperatures	210 on #1 cyl.	215 on #1 cyl.
Engine Vibration	smooth	smooth
Propeller Smoothness	smooth	smooth
Indicated air speed level flight full power at critical altitude	210 m.p.h.	210 m.p.h.

SHIP'S BALANCE
 Lateral 1 degree right tab Directional 3 degrees right tab Longitudinal 0 degrees tab

Top, test pilot with pad strapped to knee for recording instrument readings. Center, typical report on test flight in two-engined airplane

on the brakes with the throttle. A pursuit plane moves so fast in a dive that air resistance alone against the propeller spins the propeller and pistons faster than they normally move. The way to slow them down is to admit more air with the throttle, thus increasing engine pressures and slowing down the propeller rotation. Then the propeller acts as a brake against the air.

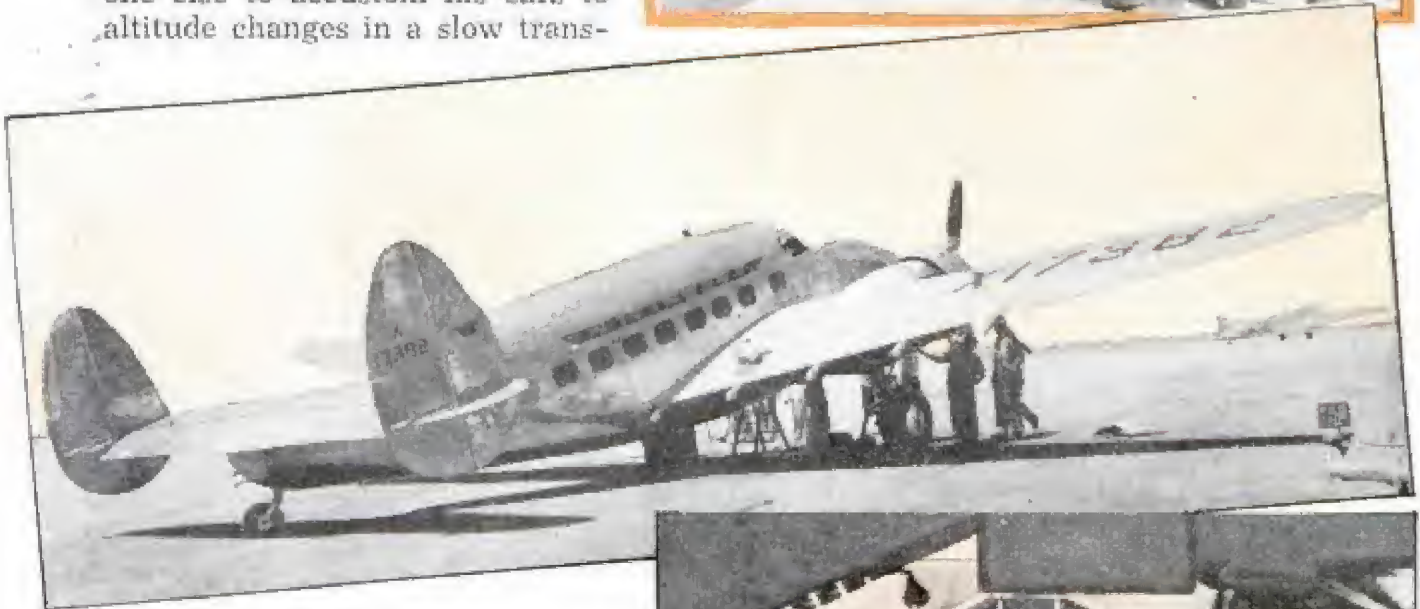
There is always a chance that something will happen in a high-speed dive. "If something goes wrong the flyer has only a few seconds in which to flip off his safety belt, slam back the hatch of his canopy, try to



Transparent canopy slides forward and protects pilot from air blast in tests

United States who try out the very latest fighters and light bombers have traveled faster in diving airplanes than any other men in the world. The speeds they have made in secret trials are far higher than present official world records. What they are learning in the air, the smoothness of flight at 500 miles per hour, the lack of unusual reactions from high speed alone, convinces them that man is physically and psychologically able to handle two or three times such speeds when he builds machines that will fly them.

Different pilots get different sensations from terminal velocity dives and "high G" pull-outs. A pilot who has to swallow like any one else to accustom his ears to altitude changes in a slow trans-



Center, double tail group of new midwing transport being prepared for test

port can dive straight down for 10,000 feet in a fast plane and not be affected at all. One explanation is that the rapidly increasing density of the air during a dive forces air mechanically into the ear passages, though some pilots think that the tight transparent canopies of the fighting planes prevent dense air from leaking in too fast and the ears are able to accustom themselves to the slow change.

Pilots are learning that in most cases the effects of a flat pull-out

(Continued to page 122A)



Top, canopy gives plane a humpbacked appearance. Bottom, cockpit of modern air liner shows numerous control instruments

Potato Cleaner and Sorter Has Set of Rubber "Fingers"



Here is the potato cleaner and sorter in operation. Electric motor at rear end drives the rubber-finger mechanism

Designed with rubber "fingers," a new machine cleans and sorts potatoes automatically. The rubber fingers are mounted on pairs of disks which are set farther apart as the potatoes travel along the assembly, causing the potatoes to fall into different hoppers, according to size. The fingers, of special rubber, clean the tubers without injury.

Ventilator Built in Stovepipe Removes Cooking Odors



Odors and fumes may be removed from the kitchen by a ventilator that is an integral part of a twenty-four inch length of stovepipe. An electrically operated fan in the ventilator runs quietly and at low cost. For stoves

lacking pipes there is a model that fits into the flue opening in the hood. Installed where odors and smoke prevail, the ventilator removes about as much air in one minute as other types remove in a considerable longer time.

Quick-Release Crash Belt Helps Pilot Escape

Army pilots are testing a new type crash belt with an instantaneous-release catch which may save lives of fliers caught in wrecked planes. The belt is a combination of the usual waist belt and suspenders, which are secured in front by a single metal hook. The pilot can free himself from the straps on landing by flicking a lever that releases the hook. During normal flying conditions the straps would be left loose for comfort and easy operation of the controls; in an emergency the straps are tightened by pulling a chain between the knees. This



Quick pull on chain tightens belt in emergency and pilot can free himself by flicking lever in buckle

Designer, J. L. Manson, Army

Ventilator Sales Corp.
1715 Euclid Ave.
Cleveland, Ohio

Tested at Wright Field

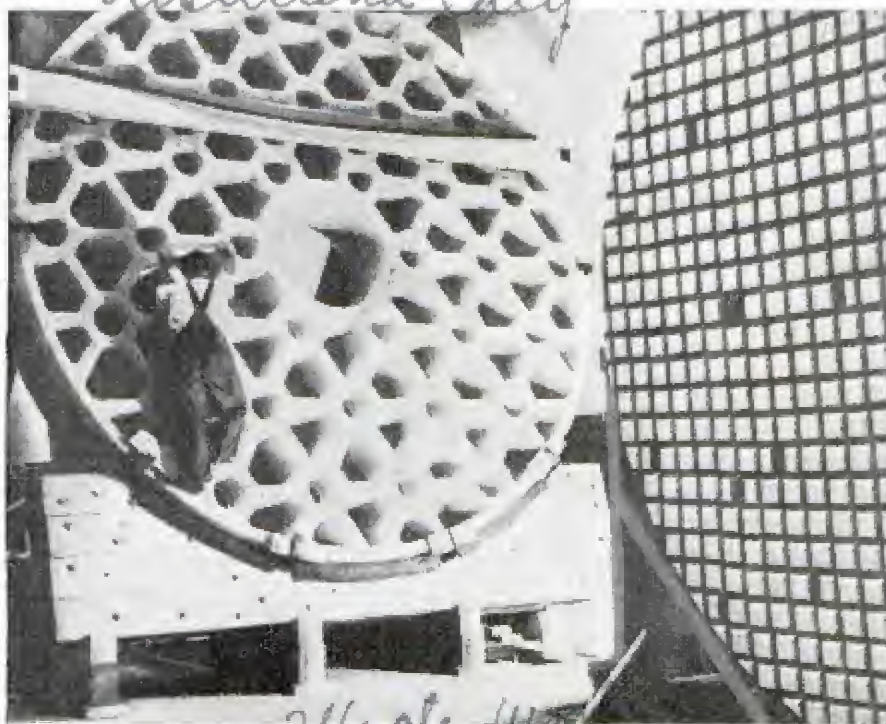
Capt. Charles J. Warner

201164
Newspaper, Dayton, Ohio

chain passes through a tube under the seat to the suspender straps in back, and is held taut by a snubber. Use of the belt would prevent head injuries against the instrument panel, cause of a large percentage of crash fatalities. The belt is adaptable to passengers as well as pilot.

Huge Glass-Faceted Grinder Shapes 200-Inch Lens

Ready to shape the 200-inch star mirror at California Institute of Technology is a huge glass-faceted grinding tool. Whenever it is not on the grinding machine the big glass disk is kept in a protective sling-frame to prevent any shock. The mirror is made of borosilicate glass, which expands and contracts very little in changes in temperature.



Checkerboard disk at right is big glass-faceted tool used to grind telescope lens. At left is the 200-inch mirror resting in protective sling

Projector of Moving Words Latest in Advertising Devices



Projector and some examples of advertising signs it produces. The machine, which operates automatically, weighs thirty pounds

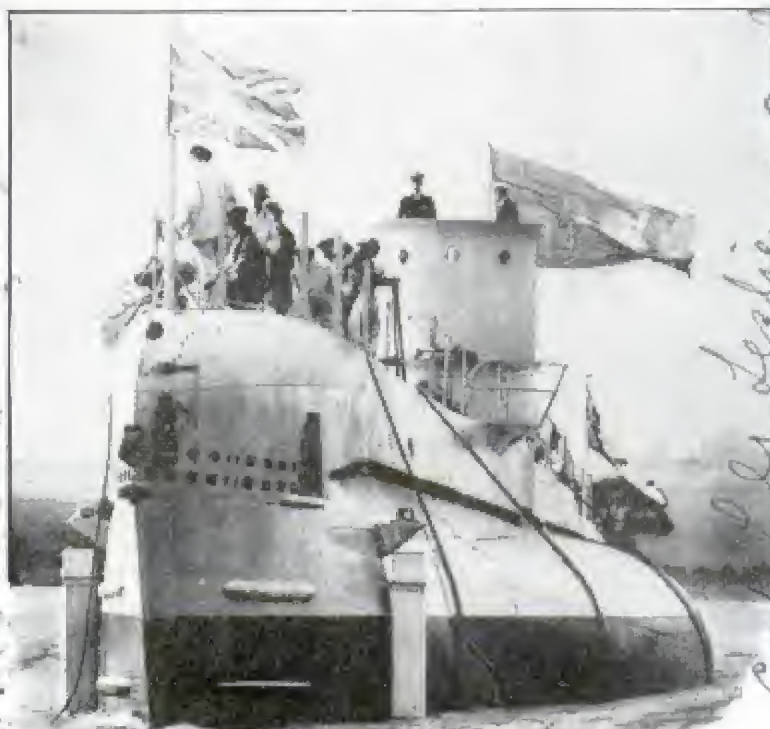
One of the latest means of carrying a sales message to the public is a projector which flashes moving words on walls of buildings, on top of buildings, inside of entrances, around borders of canopies extending over walks, and elsewhere. Film or stencil belts may be used. The number of words can be unlimited. Letters from one-half inch to three feet high,

with a spread of thirty-five feet, in any color, may be produced, with the reading matter appearing on a straight, curved or angular line. Continuous and automatic, the machine weighs only thirty pounds. It requires no more attention than an electric fan. It operates on the principle of a projection machine using one 500 or 1,000-watt lamp. Power is furnished by one motor.

❏Inquiries as to makers of articles described in Popular Mechanics, will be answered by our Bureau of Information upon receipt of return postage.

Projecting Moving Words
C. Krupnik
N. Kedzie, Chicago
4505

Quick-Diving Submarine Launched in British Yard

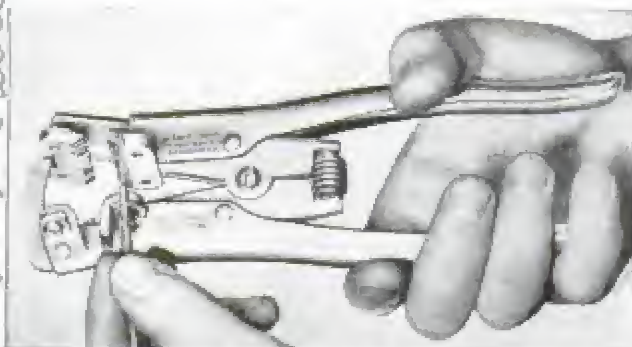


British submarine "Sterlet," last of a group of twelve quick-diving boats, immediately after its recent launching at Chatham

Ability to dive quickly when threatened is an essential feature of modern submarines, and the latest addition to the British navy was planned for speedy submersion. Last of a group of twelve submarines built since 1930, H.M.S. "Sterlet" was launched recently at Chatham dockyards.

Insulation Stripped off Wiring by Electrical Pliers

Operated like pliers, a new device for electrical workers strips wiring of its insulation. The tool cuts and strips the insulation in one movement. Crushing



Stripping the insulation off electrical wiring with tool that works like pliers

stranded wiring is avoided by providing for the jaws of the tool to remain open until the wire is removed. The stripper accommodates wiring of various sizes.

Inexpensive Barn Is Built from Old Freight Cars

When a California farmer found that he needed a new barn, but lacked the money for building one, he purchased, at a low price, two old refrigerator cars discarded by a railroad. The cars were set about twenty feet apart and a roof built over the intervening space. In one car the farmer now stores grain, in the other he stores fertilizer. The space between is fenced and used as a feeding lot.

Secret Pocket for Films in Latest Album

Filing negatives of photographic film is made easy for the ama-



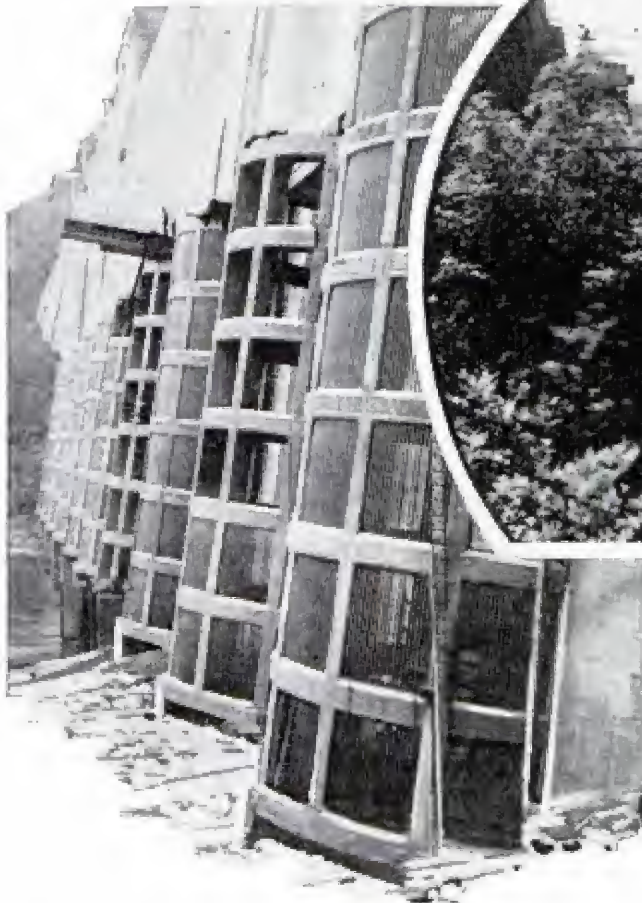
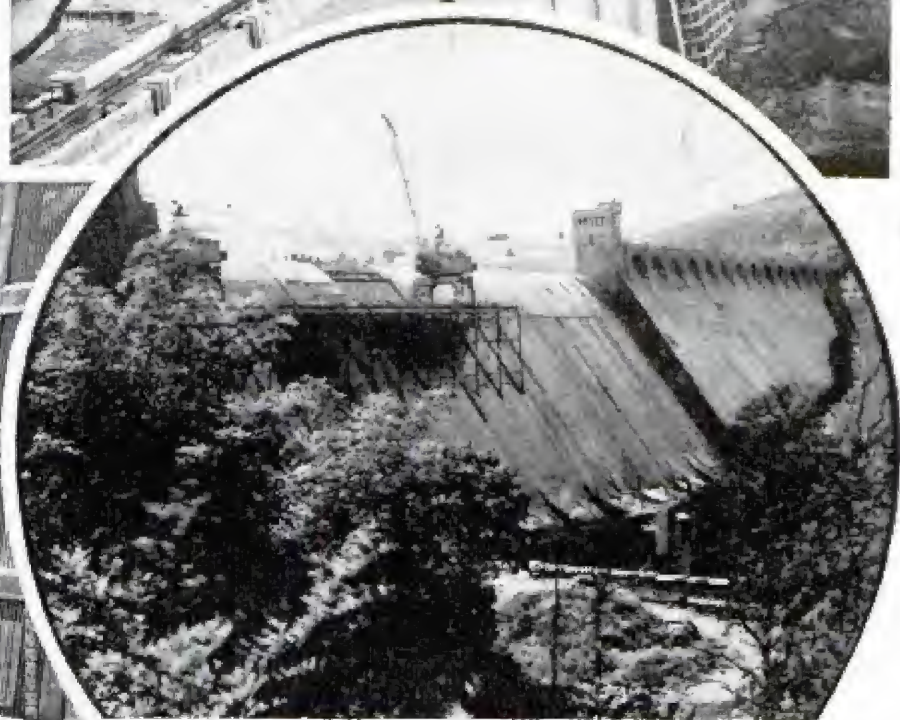
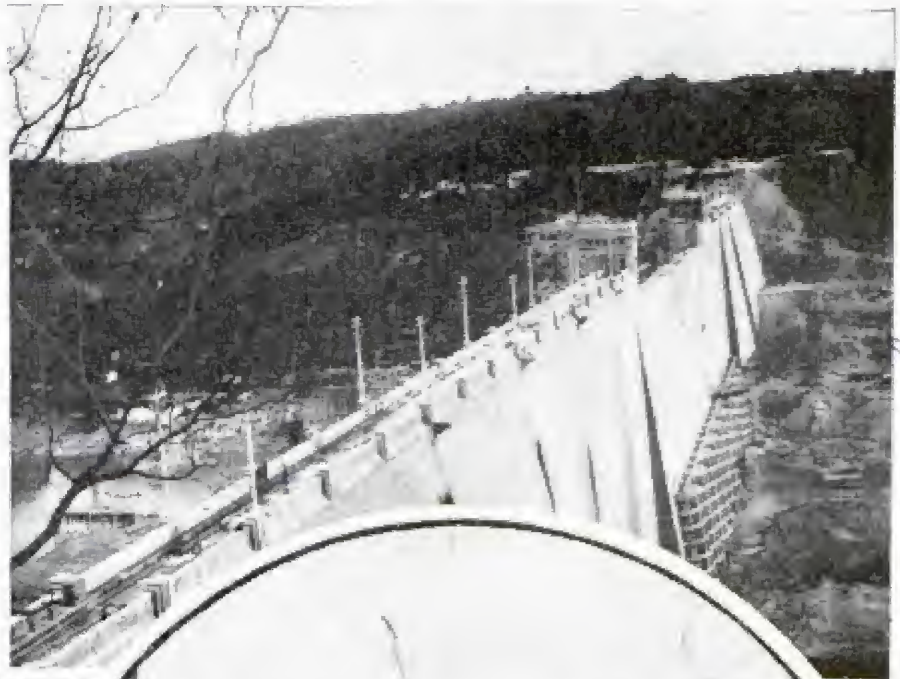
Slipped into pocket in album leaf, these negatives are identified by photo

teur by a patented album whose leaves contain secret pockets. The negatives are filed in the pocket of the leaf on which the prints are mounted, thus making identification easier. The pocket is formed by two pages of the album being pasted together, with a Cellophane enclosure for negatives.

J. W. Nelson Edwards,
111 W. Lexington St.

West Virginia Dam Rises to Challenge Floods

First of a series of dams planned to end the flood menace in the Allegheny and Monongahela river valleys, the Tygart river dam spans a Monongahela tributary two miles south of Grafton, W. Va. Started in December, 1934, it now rises 265 feet from its bed in the river and reaches 1,900 from bank to bank, with a thickness of 207 feet at the base. Its dual purpose is to regulate floodwaters and to provide storage for sufficient water to insure



Top, upstream side of Tygart river dam near Grafton, W. Va., 1,900 feet from bank to bank. In circle, a view of downstream face as last concrete was poured recently. Left, close-up of the big trash racks, visible in top picture, which protect the water gates from clogging with debris. The dam is 265 feet high

a navigable stage during the dry season. Its drainage area covers 1,220 square miles with a sixty-eight mile shore line. The dam contains 1,247,060 cubic yards of concrete, 3,200,000 pounds of reinforcing steel and 4,390,705 pounds of steel valve and linings. On the upstream side is a series of trash racks, huge semicircular cages over

the water conduits to prevent debris from clogging the gates or outlets. Construction of the dam entailed also the rebuilding of twelve miles of the Baltimore and Ohio railroad branch which follows the Tygart valley, to place it above the new high water level. The entire project cost more than \$18,000,000.

Cmt. A. O. Aldrich, Mayor, W. Va.

25/06/7

cmr. Isianr.

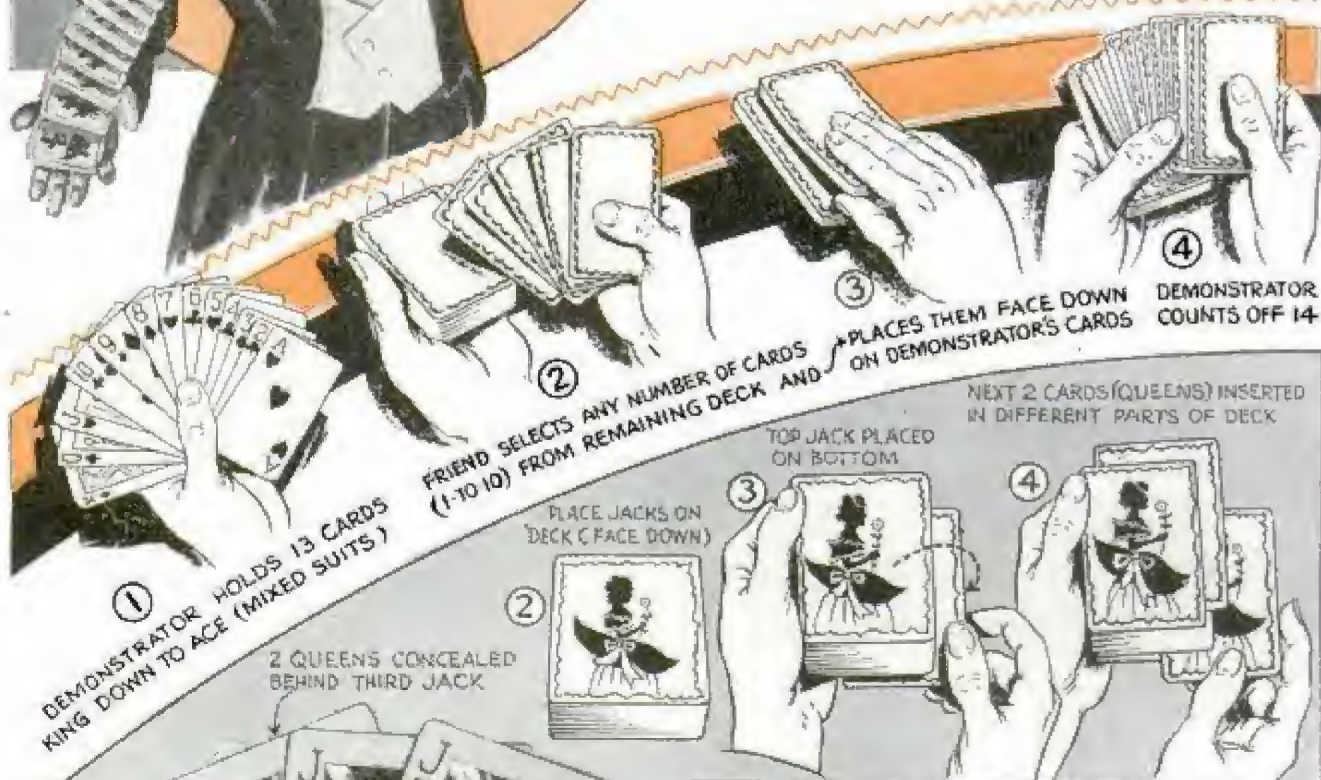
Red and Black



YOU'D like to stand ace high as an entertainer in your crowd? Just brush up on these card tricks and spring them when there's a lull in the party.

Draw a pack of cards from your pocket, divide it into two parts and hand someone the bottom part, nonchalantly asking him to take any number of cards up to ten from his half of the deck and you will undertake to tell him how many he removed. It's simple, to you, but baffling to the other fellow.

You turn your back while he chooses



Above, guessing number of cards removed. Below, hidden queens make the jacks inseparable



his cards—let us say seven—and at your direction lays them on top of your half of the deck, which you have left face down on the table. Then you face the audience, pick up the cards, knit your brows as if deeply concentrating on your problem; thumb over the cards still face down, and finally pick up the fourteenth card from the top and flip it over. To the amazement of the crowd, the card is a seven spot, and you an-

U. S. Playing Cards
Park Ave., Hollywood, Cincinnati, Ohio.

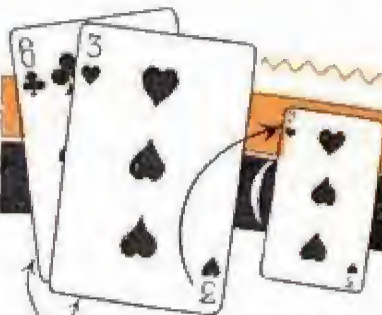
MAGIC

nounce that your friend has transferred seven cards from his hand to yours!

This trick depends on a "stacked" deck. You have arranged it in advance so the top thirteen cards are in order from king down to ace of mixed suits. Keep this upper part of the deck as yours, and let your friend select his one to ten cards from the other part. The number of cards



Is called "Card Tricks for Amateurs" by Magicians



ASSUMING THAT THE 3 AND 6 ARE PICKED

$$\times 2) + (5) \times (5) + (6) = 61$$

THE OTHER CARD

SUBTRACT 25 FROM TOTAL AND GET 36
ONE CARD IS 3 THE OTHER



Above, formula for discovering value of two cards.
Below, pairing kings and queens by "touch"

he adds on top of yours will always equal the number of spots on the fourteenth card down.

Here is a trick that looks like sleight of hand, and by making a few mystic passes you can throw off detection of the method.

Spread out four jacks and two queens in your hand so the audience can see only the jacks, hiding the pair of queens behind one jack. Then, careful not to





Top, reading the minds of five persons in the five-card, five-row trick. At right, the clock-dial stunt

expose the queens, place all six cards face down on top of the deck; first two of the jacks, then the jack and its two hidden queens, and lastly the fourth jack. Now tell your audience you will split the jacks up in various parts of the deck and bring them together again by a simple cut of the cards. First you place the top jack on the bottom of the deck; then, slip the next two cards—the queens, which the spectators think are two jacks—into two different places in the deck; cut the cards once, and hand them to anyone in the crowd. He will find all the jacks together, for the cut has replaced the bottom jack with the three left on top.

An easy stunt to remember is that of "divining" the numbers on two cards chosen at random by the audience. You prepare a pack consisting of the aces, deuces, threes, fours, fives, sixes, sevens, eights and nines of all four suits and let someone shuffle it as he pleases. Then one of the spectators picks two cards which are concealed from you. Ask him to take either one of those cards and mul-

tiple its number of spots by two, add five, multiply this sum by five, and then add the number of spots on his second card.

"What is your result?" you ask him. Quickly you deduct twenty-five from the figure he gives you, leaving a two-digit number of which each digit represents the spots on the cards he drew. Assume for example that he picked a three and a six. Taking the three and doubling it, he had six; adding five made eleven, multiplied by five made it fifty-five, to which he added the six for a total of sixty-one. Mentally you subtract twenty-five, leaving thirty-six—and you announce that his cards were a three and a six.

It is a good idea never to repeat tricks for the audience. Don't give the other fellow a chance to "catch on." A bit of stagecraft, mysterious action with the hands, chatter that distracts attention, all these throw your audience off the trail and make the simplest mathematical or sleight-of-hand trick seem a feat of magic.

Have one of your friends pick out



the kings and queens from a deck and examine them to satisfy the entire audience that the royal pairs are not marked. Then toss them down in a pile as carelessly as you can, without calling attention to the fact that you are laying them down in order—first a king, then the queen of its suit, another king and its mate, and so on. Now ask someone to cut the cards, face down, with a simple cut, as often as they like. Apparently the cards have been well mixed.

"My sense of touch," you say, "is so delicate I can tell a queen's complexion by my fingertips. Without looking, I shall separate kings from queens."

As you talk, you hold the cards behind your back and deftly pick out the first, third, fifth and seventh card with one hand, and produce the other four cards in the other hand. Dramatically you disclose four queens in one hand,



Above, producing the unknown card by cutting deck. Left, discovering two cards by separating colors



four kings in the other! You can just as easily produce them in pairs, by picking up first the four kings and then the four queens, taking care the queens are in the same order of suit—for example, diamonds, spades, clubs and hearts. Allowing any number of simple cuts, take the cards behind your back and divide them into two hands of four. Pairing the top card of each hand one after another you produce a mated king and queen.

The ten-hour clock dial trick is one that your audience seldom can solve. You arrange ten cards of any suit in a circle from one to ten and ask a spectator to point to any card and to think of some other card in the circle. Tell him you are a mind reader and that you can make him point to the card he is concentrating upon. Secretly you add ten to the number at which he is pointing, and, if he has indicated the five spot, have him count backward around the circle until he reaches fifteen, starting with the five spot but calling it by the number of his secret card.

(Continued to page 142A)

'Mike' Like a Machine Gun Is Aimed at Sound



Aiming the machine-gun microphone at source of sound, a passing parade

Shaped something like a machine gun, the latest microphone is aimed at the sound source to pick up the maximum volume for broadcast purposes. Thus may be eliminated to a great degree, sounds from other sources. The microphone may be trained on a passing band to pick up the musical sounds during parades.

Diesel Railroad Track Shifter Speeds Up Work

Less expensive than the usual equipment employed for the purpose, a one-man railroad track shifter speeds up work along



Track shifter being used to move rails and cross-ties into a new position

the right of way. It is Diesel-powered. The machine is firmly bolted to the track and a ram inserted on a slant between the two sleepers. Then the traveling mechanism is switched on and the ram forces the track to move sideways. The machine is moved farther up the track and the process is repeated. For building embankments without tearing up the track, the ram is fitted to lift the rails and cross-ties vertically. Workmen may then fill in between the old track bed and the rails.

Two-Story House on Wheels Has Bed in Upper Deck

There is room for two double beds in the streamline touring sedan built by a Californian for his vacation home on wheels. He spent seven years developing it. On the "first floor" are four upholstered chairs which readily convert into a comfortable double bed. When the top is



There's an extra double bed on second floor of this touring home when its roof is elevated at night

raised, it forms an "upstairs" room containing a magazine bed. Fresh air is supplied by a specially built ventilating system. In the roomy rear end of the car is a refrigerator and sink with running water, and storage space. The car is of standard width and has a 138-inch wheelbase.

Western Hemlock Bark
Sole leather of good lasting qualities can be obtained by tanning with a blend including tannin extracted from the bark of the western hemlock.

Bureau of Chemistry
and Sals. 10/20/37

Horse-Drawn Fire Engines Do Double Duty

*431 W. 68th Terrace
Kansas City, Mo*



Several views of camera crews getting spectacular shots for movie dealing with Chicago's great fire. Note the part played by the old fire engines in their dash to different parts of the city and in fighting the flames

Fire-fighting equipment that once was used in Los Angeles is doing double duty in Hollywood, being photographed in historical films and generating steam for power on the motion-picture lots. Although some of the horse-drawn engines are more than forty years old, their pumps still function. During a flood at one studio, the machinery of one old engine turned over under steam developed in the original boiler to pump water out of a film vault. For movies such as "In Old Chicago," which

has the city's great fire of 1871 as one of its highlights, the old engines come into their own. To give theater audiences a new thrill, the camera crews mount their equipment on a truck and grind out spec-



tacular shots of the old engines, drawn by big fast horses, dashing to a fire in the awe-inspiring manner which was so familiar to Chicago's residents of more than sixty years ago.

Gas-Heated Clothes Drier Holds Entire Wash



Gas clothes drier for home laundry packs in a small space the equivalent of ninety-six feet of line

There is room for an entire household washing in a gas-heated clothes drier just placed on the market. Occupying less floor space than a kitchen table, it has twenty-four drying rods mounted in two tiers providing the equivalent of ninety-six feet of clothesline. The gas consumption of the heating unit is said to be low, and the washing can be dried in two hours or less.

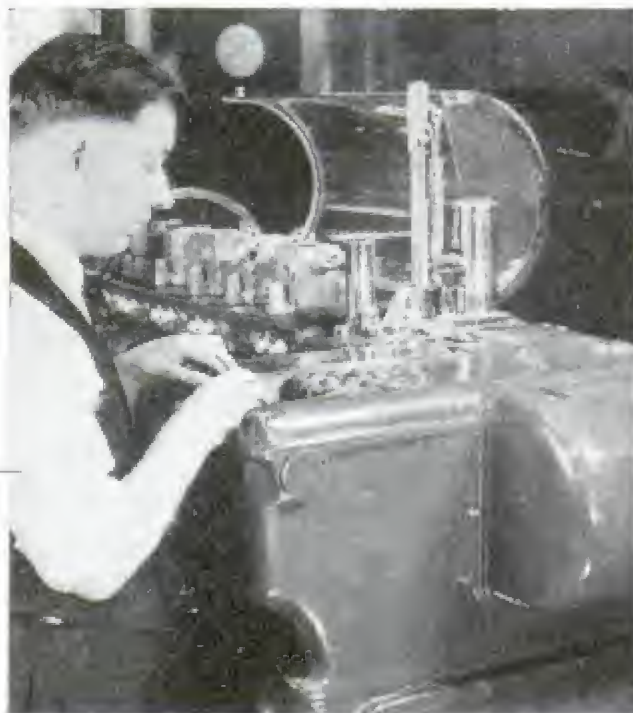
Electric Shock to Brain of Cat Makes It Stand on Forepaws

By administering a very slight electric shock to the brain of a cat, it can be made to perform strange acrobatics. In laboratory experiments at Vanderbilt University, hairlike electrodes were placed on the brain surface and harmless shocks given. If the electrode touched the left side of the brain, the cat would slowly lift its left foreleg, then the right foreleg, left hind leg and right hind leg, the movements covering six or seven minutes. A shock to the right side of the brain had a similar effect, but starting with the right foreleg. If the

electrode touched a spot in the middle, the cat would lift both forelegs and sit on its haunches, then lift both hind legs and try to stand on its forepaws.

Auto Parts Tester "Feels," "Sees" and "Hears"

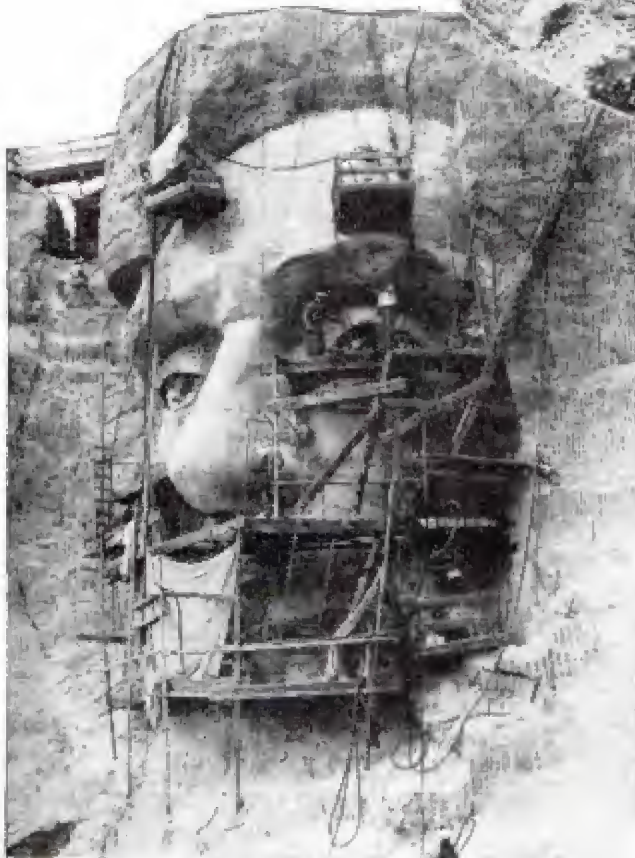
Inspection of auto-engine valve lifters is speeded up and made more accurate by a machine which "feels," "sees" and "hears." A weight bounces off each valve lifter and intercepts a light beam if the part has been hardened properly. If the part is too soft, the rebound does not intercept the light beam and a rejector kicks the part into a bin. Thus the machine "sees." Then a hammer strikes a valve lifter that has passed the first test. A crystal microphone sends the sound through an amplifier fitted with a frequency filter. If there is a crack in the valve lifter, it doesn't resound properly and is rejected. In this check the machine "hears." Other tests are performed by electrical gauges which automatically pass all parts machined within the limits allowed. This is the function of "feeling." The parts are placed on a mesh-chain conveyor which carries them into the machine one at a time for the tests. They are in upright position during part of the inspection trip and in horizontal position for the remainder. The machine makes sixteen tests.



Feeding valve lifters into machine that inspects auto parts with super-accuracy

Lincoln's Head on Mountainside Is Unveiled

Right, general view of the Mt. Rushmore memorial near Rapid City, S. D. Below, close-up of workmen, under the direction of Gutzon Borglum, carving the head of Abraham Lincoln



Sixty-six feet from chin to crown, the giant head of Abraham Lincoln being carved on the granite face of Mount Rushmore is nearing completion. Recently it was unveiled, another step in the work of carving the heads of George Washington, Thomas Jefferson, Theodore Roosevelt and Lincoln on the mountainside in a national memorial. Upon completion the head recently unveiled will show a bearded Lincoln. Faces of Washington and Jefferson already are well-formed and the features of Roosevelt will be cut in the granite between Jefferson and Lincoln. Sculptor Gutzon Borglum expects to complete Roosevelt's head within three years, marking completion of the entire project. The memorial is located in the Black Hills near Rapid City, South Dakota.

Small Mover for Big Freight Cars Eliminates Pinchbar

Shifting loaded freight cars for short distances is made easy by a small electric mover which eliminates use of the pinchbar. The mover is operated by a one-quarter horsepower motor. It slides along the rail, keeping its sturdy nose rooting under the car wheel. An arm swinging around the rim of the car wheel pulls the mover as the wheel revolves. A set of wheels and a looped handle make the mover easy to trundle around the yards.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.



Small one-quarter horsepower device which easily shifts loaded freight cars in railroad yards by rooting under the wheel

H. W. Pierce & Son, Inc., Anaheim, Calif. 756 N. Olive

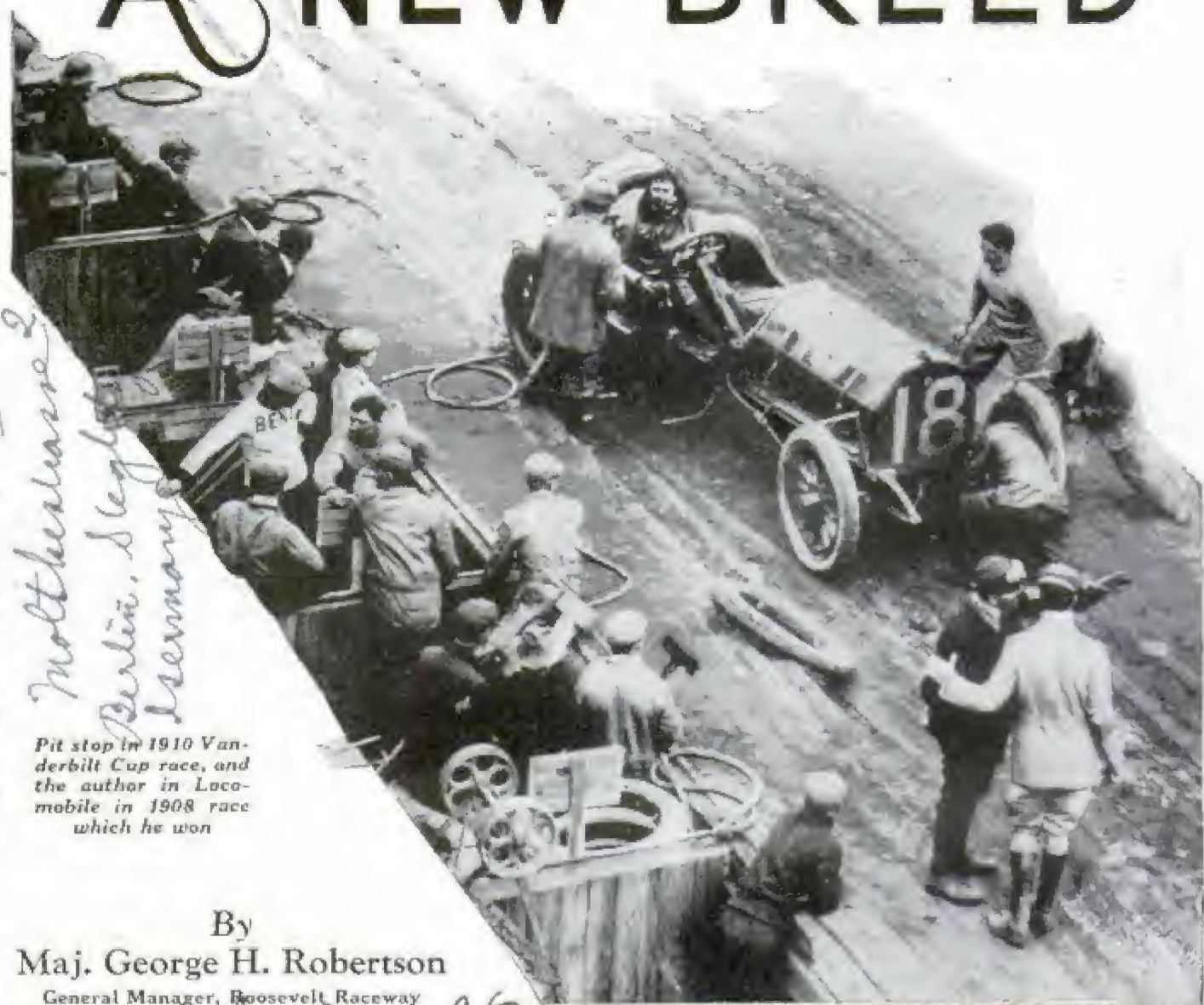
es. 1140

A NEW BREED

Capt. Hans J. Rietzschbach,

Mottherrasse 2

Berlin, Sleght
Germany



Pit stop in 1910 Vanderbilt Cup race, and the author in Locomobile in 1908 race which he won

By
Maj. George H. Robertson
General Manager, Roosevelt Raceway

see July 1937 - 26

ARE European racing drivers better than the Americans?

Ever since I became the first American driver to win a Vanderbilt Cup race thirty years ago, I have been asked that question hundreds of times each year. I couldn't answer it. No one else could.

The reason no one knew is that racing cars in international competition have rarely been evenly matched. As a result, the best cars—rather than the best drivers—often won because the best driver in the world has a slim chance to come in first if he pilots the slowest car.

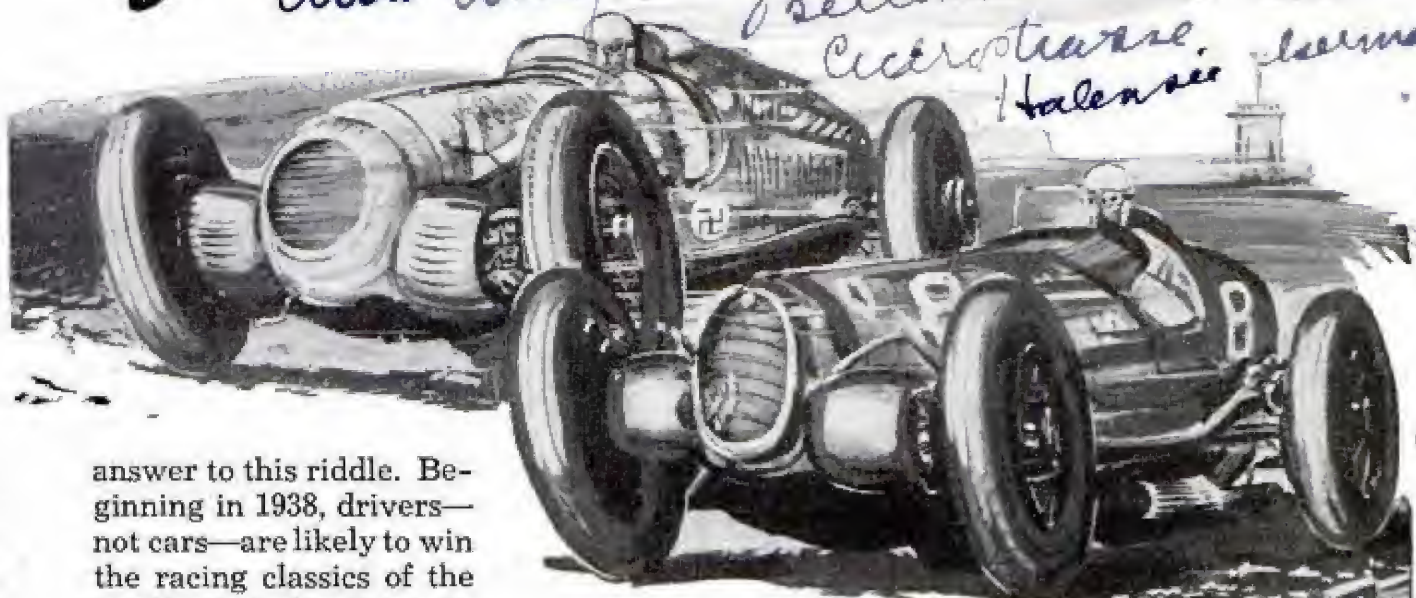
Now we are about to learn the



Maurice Block, A.A.A.
Champion 1936

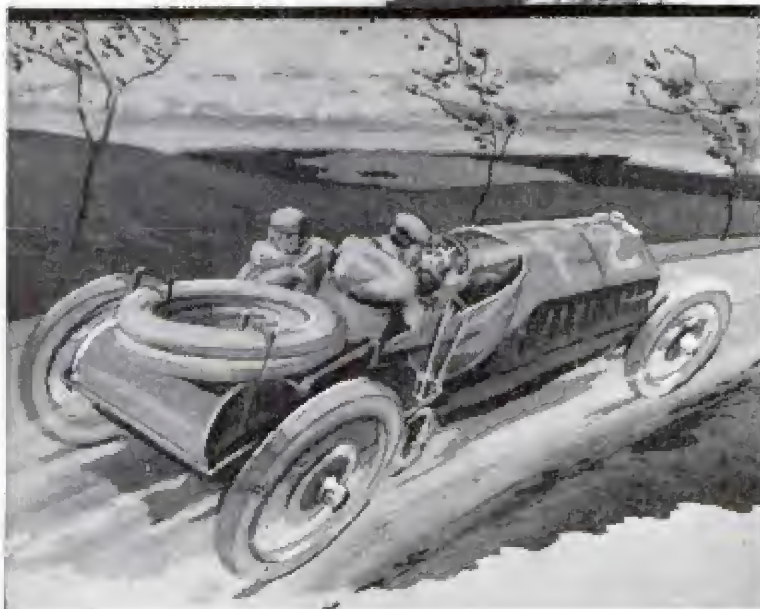
of RACING CARS

Bernard Rosenberger, Auto Union Car
Auto Union, A. S. Berlin.
Es 1140
Cicerostrasse, Halensee, Germany



Cars which won 1936 and 1937 Vanderbilt Cup races. Below, an early Grand Prix winner

answer to this riddle. Beginning in 1938, drivers—not cars—are likely to win the racing classics of the world more often because, for the first time in years, all cars—American and European alike—must conform to the same specifications for piston displacement and weight.



With the cars thus evenly matched, it then will be up to the drivers to show their stuff.

Both American and foreign cars have been placed on a more even competitive basis by the adoption by America this year of what is called the "international racing formula." This formula, which is to apply

for three years, beginning in 1938, fixes piston displacement and minimum weight restrictions which will necessitate the building of new cars or the complete redesigning of old ones to come within the limits of the formula.

As a result, race fans will see a brand new breed of cars competing in 1938 because the formula applies to the 500-mile track classic at Indianapolis, and the 300-mile road race for the Vanderbilt Cup at Roosevelt Raceway and to most of the major races in Europe as well.

Adoption of the formula means a new deal for American automobile racing, a revival of the once keen competition between American and European cars and drivers. This competition had virtually ceased until the Vanderbilt Cup races were revived a couple of years ago. Why?

Because Europe was intrigued by road racing and specialized in cars with big

Haggard — Herminie Touring Car



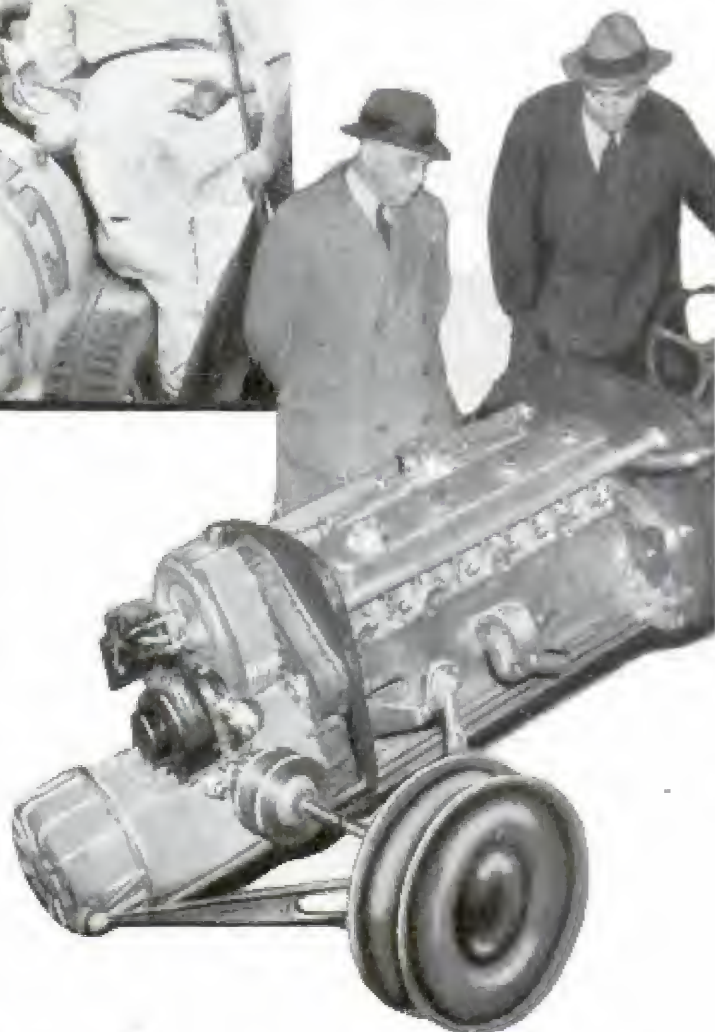
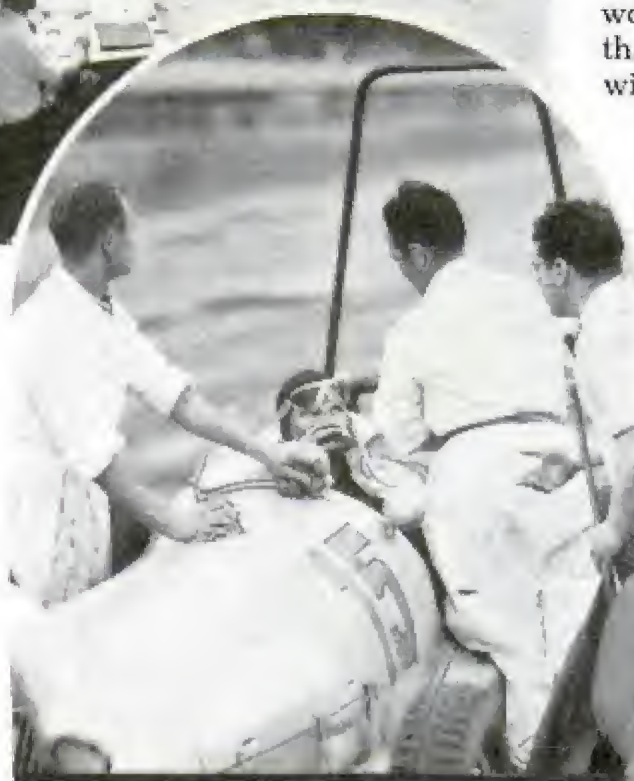
Efficient pit crews save precious seconds, above and right. Below, unusual type of race car built by Lee Oldfield

clutches, powerful brakes, superchargers, efficient transmissions and special fuels all designed for this sort of contest. America, on the other hand, has been building cars for track races—light jobs with no brakes or transmissions worthy of the name, cars intended to run wide open more than ninety per cent of the time. America's track cars and track drivers have been no match for European cars and pilots in a road contest; Europe's heavier cars and road drivers were not well adapted to track competition.

Now both the Europeans and Americans must change their designs to comply with the new specifications. When the changes have been made, American and foreign cars will be on an even footing as far as these specifications are concerned. This means we may see American cars and drivers competing on foreign courses again and foreign cars and drivers entered in an

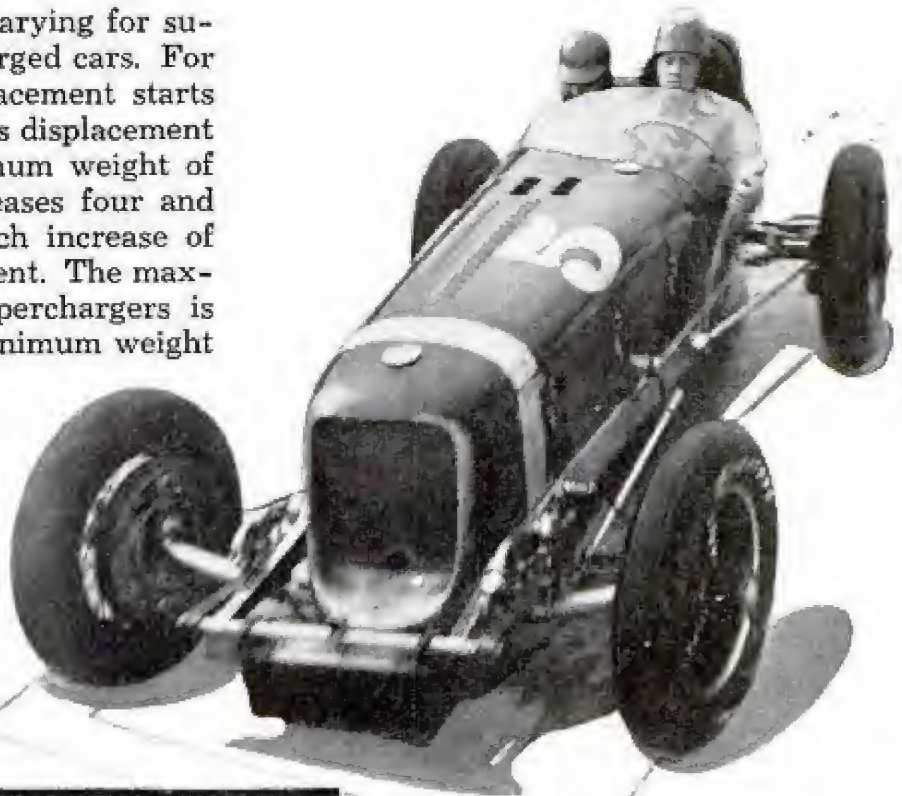
Indianapolis race. An American winner on a European course would be a novel experience for the foreigners and a foreign winner now at Indianapolis would undoubtedly jolt American car designers and drivers. Only once, in 1921, has an American car and driver won a European classic, when Jimmy Murphy won the French Grand Prix in a Duesenberg. The foreigners, however, won the Indianapolis race three times, Jules Goux winning with a Peugeot in 1913, Rene Thomas in a Delage in 1914, and Dario Resta in a Peugeot in 1916.

The formula fixes minimum weights for various piston



displacements, the figures varying for supercharged and unsupercharged cars. For superchargers, piston displacement starts at 40.6 cubic inches. For this displacement the car must have a minimum weight of 881.8 pounds. Weight increases four and one-quarter pounds for each increase of 0.61 cubic inch of displacement. The maximum displacement for superchargers is 183 cubic inches and the minimum weight for this displacement is 1,873 pounds.

For non-supercharged cars, piston displacement starts at sixty-one cubic inches and minimum weight at 881.8 pounds. Weight increases 2.8 pounds for each increase of 0.61 cubic inch of displacement, the maximum



Lee Oldfield in his rear-motored car on Indianapolis speedway, left. Above, Jimmy Snyder in car which broke lap record

may not immediately produce cars to match the most advanced European jobs. The European race cars are built by the car manufacturers, are well financed, and have the advantage of highly skilled engineering staffs. In some instances, these cars have received government subsidy. So they can

afford to go into highly experimental stuff. Our racing car designers and drivers can't afford to spend a fortune trying out something which might prove wholly impractical after all.

All told, there are, perhaps, fifteen American cars now being built for Indianapolis and Roosevelt Raceway in 1938. These new cars, naturally, are experimental. But so are the foreign cars. We hope that money will be forthcoming from various interests for experimental work which will produce more cars for 1938, in addition to the fifteen already scheduled.

(Continued to page 134A)

displacement permitted being 274.5 cubic inches. The minimum weight for this displacement is also 1,873 pounds. The first formula cars may be slower than their predecessors because of the minimum weight and smaller motor provisions, but as the racing experience with these new types of cars continues, speeds will mount.

While the formula places everyone on an even footing so far as displacement and weight are concerned, designers and engineers are not restricted otherwise. All are free to exercise their own ingenuity in design—if they have the money to do it. And that's why, despite the formula, America

Doomed Ships in Graveyard

Wait for Torch of Wrecker



Clogging channel of the Kill van Kull on Staten Island are these discarded ships once worth \$1,000,000 each, now for sale as junk metal

In the Kill van Kull on Staten Island, graveyard of ships, a fleet of more than fifty once-proud vessels floats idly, awaiting the wrecker's torch. Discarded now as worthless and uneconomical, they cost \$1,000,000 or more apiece to build. Part of the fleet of old government boats has been destroyed by fire and some of them have been sold for scrap, selling for \$14,000 to \$50,000 each for the metal that can be salvaged.

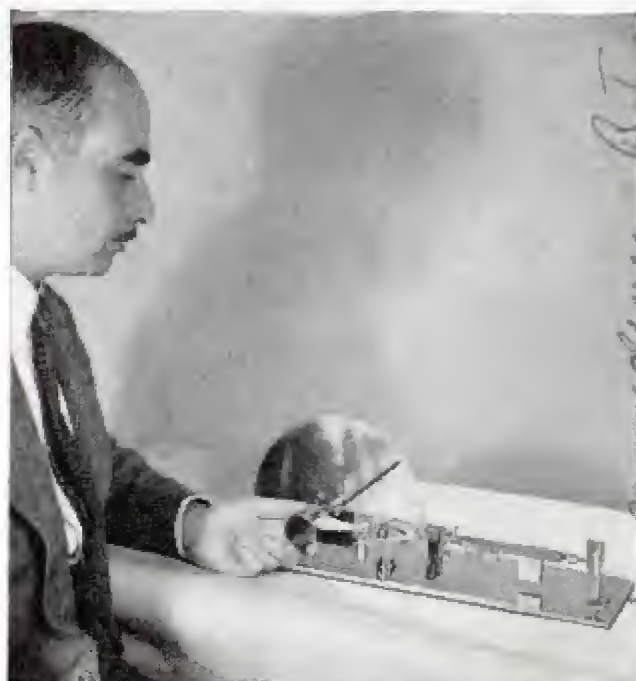
Steel Coated with Aluminum Resistant to Corrosion

Highly resistant to corrosion, abrasion and acids, steel coated with aluminum lends itself to production of wire, rod, sheet and other forms in a continuous manner. Machine parts subject to corrosion may be made of this aluminum-coated steel in smaller and lighter sections than formerly, since it has the great tensile strength of steel, as well as the high corrosion resistance of aluminum. The coated

steel is capable of being heated to 1,000 degrees centigrade for 1,000 hours without destruction and of being subjected to metal working processes without cracking or detachment of the coating. The coating process was developed by Professor Colin G. Fink of Columbia university.

Tester for Cloth Shows Degree of Stiffness

No longer is it necessary for the buyer to depend upon the human element in choosing cloth. A mechanical tester now determines the stiffness of cloth. It also shows resiliency, elastic recovery, plastic deformation and the efficiency of softening and stiffening agents. The instrument is operated by fastening one end of a strip of cloth in the device and turning the other end. This exerts a pressure which is weighed on a sensitive balance.



Testing cloth for stiffness with new machine

Process developed by
Prof. Colin G. Fink

Mr. Irving
Saxl. Consulting

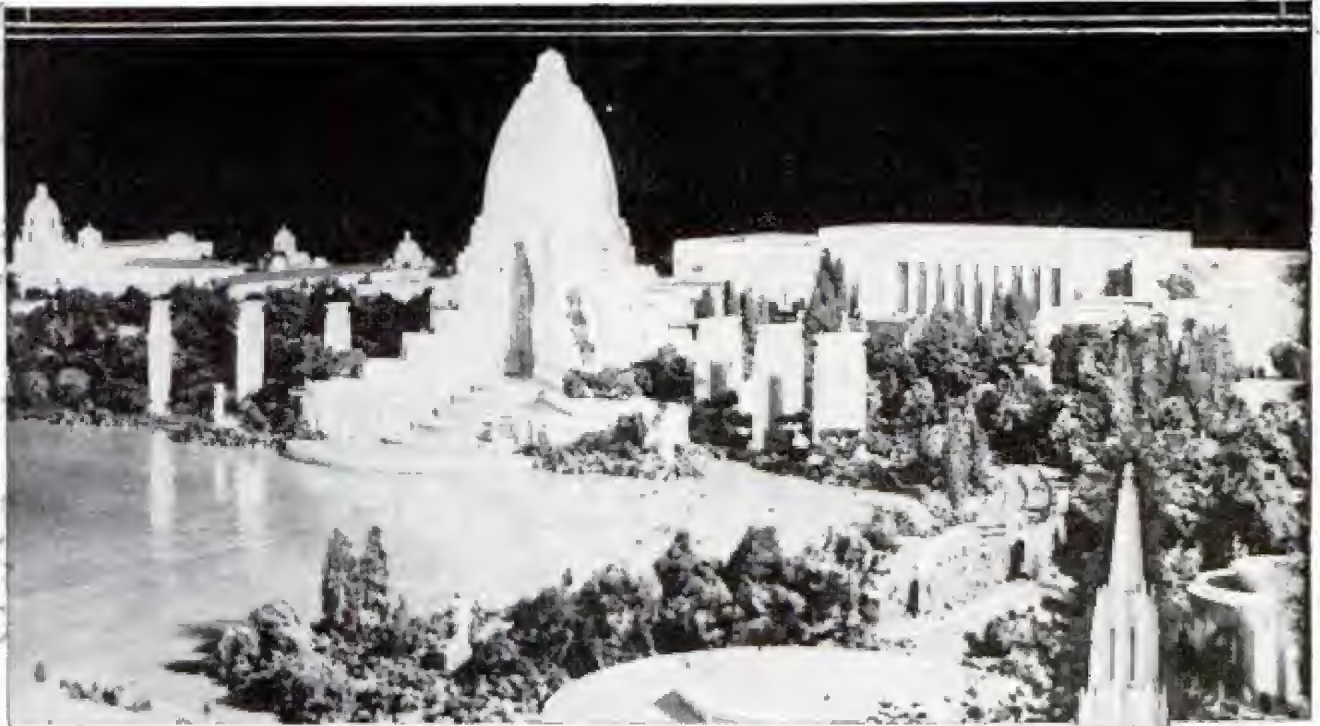
Industrial
Textile
Research
Co.

no further information

201247

Kansas
Engineering
1937

Model Shows Giant Towers of California Fair



Top, model of Temple of Music to be built on site of Golden Gate exposition, with federal building in background. Below, how main entrance will appear, flanked by "elephant towers"

Treasure Island's great pyramids and towers, blending oriental with modern architecture, are seen in the plaster models that give a preview of the Golden Gate exposition of 1939. On the brink of the Lake of All Nations rises the domelike tower of the Temple of Music on whose water-level stage symphony orchestras and choral groups will perform during the fair. Six pylons that become torches at

night flank the building. Surrounding the temple and the lake is a park planted with pines and cypress, flowering trees and shrubs, while beyond the musical center are the broad, colonnaded federal building and the Spanish California group. Reminiscent of Mayan architecture are the modern pyramids of the "Elephant Towers" that flank the main gate. Beyond the gate is the 400-foot central tower of the fair.

Shoe Fit for a Giant's Foot Weights 100 Pounds



Visitor to the London shoe and leather fair tries on a large shoe. The shoe weighs 100 pounds.

It looks like a misfit, and it is! This is no trick photography—the shoe was made for exhibition at a shoe and leather fair in London. It weighs 100 pounds and is almost as big as the young lady trying it on.

Glider Motor Drives Tiny Car Built in Home Workshop

In the special sport model car built for her by her father, this nine-year-old Long Beach, Calif., girl drives all the way to Yosemite National Park, 400 miles from her home. She is the youngest licensed



Forty miles an hour is the speed of this sport model car owned by a nine-year-old girl.

driver in her state. The tiny car, which has a rumble seat, is powered by a glider motor and can travel forty miles an hour.

Water Tank for Airship Models to Serve as Wind Tunnel

Tests of airship models will be made in a water tank instead of a wind tunnel at the Guggenheim Airship Institute. A tank measuring five by eight feet and equipped with apparatus to simulate wind gusts by means of a water jet is being built at the Institute. A water tank and a submersible model must be used in the tests because the model and the medium in which it moves must have nearly the same density. A small lighter-than-air model would be too difficult to construct and handle. Studies of what happens to an airship when a gust hits it will be carried out.

Roadside Merry-Go-Round "Ad" Turns Slowly in the Wind



Getting attention from motorists, this roadside sign revolves slowly no matter how high the wind.

Anything from a four-miles-an-hour breeze to a sixty-seven-mile gale will turn a "merry-go-round" sign developed for roadside advertising. It revolves very slowly regardless of the power of the wind, being adjustable to any desired speed of rotation. The sign is twelve feet in diameter and ten feet high. A versatile windmill, it can be made to generate electricity or pump water.

Beverly Lancaster
Long Beach, Calif.

L.B. Frye,
Merry-go-round
signs, North Platte, Neb.

Mighty Pacific Fleet Cruises in Battle Array



Parading the ocean in practice maneuvers, the United States battle fleet of dreadnoughts, cruisers and destroyers presented this beautiful sight from an airplane flying high above the clouds

Cruising in columns as far as the eye can see, the United States fleet presented a mighty spectacle from the air during recent maneuvers. An aerial photographer

flying far above the water caught this view of the battleships, cruisers and destroyers deploying in battle formation. Fleecy clouds added to the pictorial effect.

Attractive Home on Wheels Looks Like a Brick House



Its finish resembling brick, this four-wheel trailer makes a trim home

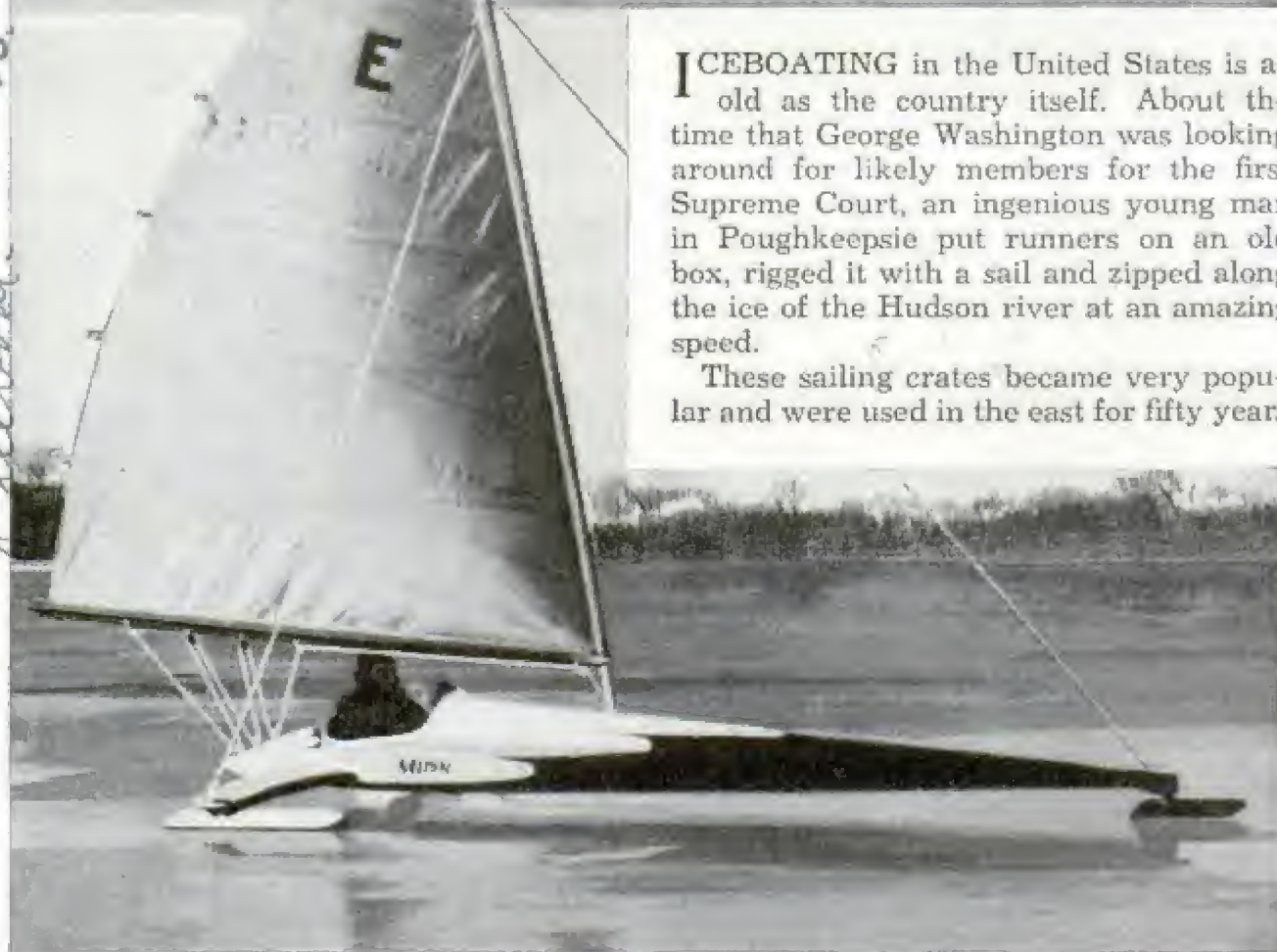
Its exterior finish closely resembling that of a brick house, the latest home on wheels is complete in every detail. It has four wheels, instead of the usual two on the trailer, hence there is no necessity for supporting one end of the house when the day's run is over. The home has shower bath, running water and electric lights, as well as many other conveniences. A neat flight of steps gives it the air of permanency.

*Home Trailer and Mfg Co
Aurora, Ill.*

es 1151

PUTTING *the* WORLD

Front sleeping sheeted 22-1/2 1934 6



ICEBOATING in the United States is as old as the country itself. About the time that George Washington was looking around for likely members for the first Supreme Court, an ingenious young man in Poughkeepsie put runners on an old box, rigged it with a sail and zipped along the ice of the Hudson river at an amazing speed.

These sailing crates became very popular and were used in the east for fifty years

Top, snugly seated in the tiny cockpit, ready for a thrilling spin along the ice. Bottom, the 1937 "Skeeter" with twenty-foot backbone and galvanized airplane wire shroud lines. Note the "E" which is its official classification

on SKIDS



R. T. Porter photos

Top, group of "Sheeter" iceboats lined up, with their pilots preparing them for a race. Bottom, this is an extra thrill, making a fast turn

with very little change in design. Then came a boat built on a triangular frame with two runners forward and a third aft, on the apex of the triangle, which was used as a rudder. These boats attained terrific speed in the gay nineties. One of them is said to have been clocked going 107 miles an hour. For sportsmen who had never known anything faster than a tandem bike, iceboating offered exciting possibilities.

Some of these boats carried 200 to 300 square feet of sail. The rider sat aft over the rudder to help hold it to the ice, but there was a tendency for the bow to lift and cause spinning on the turns, which often sent the rider off across the ice like a hockey puck. They also had a tendency to tip up on two runners in a high wind. So the boats were heavily built and often carried sandbags or weights on the bow to

Reference: - Ted Meade,

17 S. Market. Chicago



Here is another kind of iceboat, with a small batwing sail rigged on a front-steering frame. It can attain high speed, too

hold them down. This slowed them up and made them cumbersome and expensive.

The sudden rise of iceboating as a sport in this country and Canada in the last four years has been due to the development in the middle west of an entirely new type of boat; a small boat, comparatively inexpensive, easy to transport, and one that can hold its own with any of the bigger jobs.

This new boat is classified as an "E" boat for racing and is popularly known as a "Skeeter." The only two definite qualifications of an "E" boat are that it carry seventy-five square feet of sail and that the frame be built of wood. This boat has discarded all the old principles of iceboating. It carries the rudder on the front end of the backbone, and the runner plank is near the stern. This front steering offsets the tendency to spin, as the thrust of the sail holds the runner to its groove in the ice. The weight of the crew, aft, stabilizes the boat. Built with the precision and the balance of a racing airplane, the ice yacht has streamlining and strength, without an extra ounce of weight. Many of them are built with a fuselage made of lightweight wood with a canvased deck, to protect the rider from icy blasts.

Among the things that contribute to the speed of these little boats are: a twenty-foot backbone, a thirteen-foot runner plank, with some spring in it, a nineteen-

foot mast with a sharp rake aft, a main sheet rigged for multiple pressure on the sail and trimmed down through the deck near the mast, full-length battens in the sail which give a stiffer sail and a controlled draft, and straight steel runners instead of rockers. Contrary to the requirements of a sailboat in the water, the flatter the sail the better for an iceboat. Some of the newest iceboats have a foot control on the mainsheet, inside the cockpit, for instant action.

Unlike a sailboat, an iceboat always sails close-hauled. That is, it sails

with the boom laced in close over the cockpit. It never slacks off its sail to run down wind, but tacks down wind, close-hauled, just as it tacks to windward. To stop or slow down, it heads into the wind. Tacking to windward an iceboat attains its highest speed, often going four times as fast as the wind itself. For instance, in a



Here is another view of the front-steered boat rigged with batwing sail

light ten-mile wind it is entirely possible to go forty miles an hour. The reasons for this speed are the vacuum that is formed back of the sail which tends to pull the boat forward, and the ease with which polished steel passes over ice. Resistance is very small.

"Skeeter" sailors claim that they go 100 miles an hour and more in their little boats, but the only official record of speed is eighty miles an hour clocked last season over a measured mile on Lake Geneva, Wis.

The Interstate Ice Regat-

(Continued to page 156A)



Top, heeling over a bit as he makes a turn. Bottom, view of "Skeeter" showing springy type of runner plank most satisfactory for attaining high speed on the ice



Firemen Race to Ladder Top in Rescue Drill



It's a long way to solid earth when you're at the top of a fireman's ladder, anchored to nothing but the fire truck eighty-five feet below! Racing up the ladder with full equipment to rescue a dummy victim in a skyscraper is just one of the daily thrills at the New York firemen's school. It looks dangerous, and it is if you're not trained. But the firemen's school teaches future fire fighters to make their risky business as safe as rescue work will permit.

Racing to top of the ladder is daily routine at firemen's school

'Dust Magnet' Cleans the Air of Pollen, Smoke and Dirt

Dust-free air, purged of ninety-nine per cent of the microscopic dirt and bacteria floating in it, is promised the homes and factories, hospitals and offices of the not distant future by a "dust magnet" developed by Westinghouse Electric and Manufacturing company engineers. Dust particles too tiny to be stopped by a mechanical filter are pulled out of the air by the high-voltage plates of this electrostatic air cleaner. Already the first units of this system are purifying the air circulating through lower floors of one of Chicago's newest skyscrapers, and engineers are now at work developing units for the home. As the air begins the cleaning process it passes between hairlike wires carrying a charge of 12,000 volts. These wires bombard the air with ions, minute electrical charges, and the ions attach themselves to the tiny bits of dust and give them a negative electrical charge. Then the air passes through a series of cells made of alternate grounded and 5,000-volt plates. The negatively charged dust is attracted to the high-potential plates, adheres to them, and the cleansed air passes on through the building. In the Chicago installation, 272,000 cubic feet of air per minute are cleaned, and it is expected that 600 bushels

of impurities will be collected from the air in a year. The plates themselves are cleaned every month or six weeks, and analysis of the dust shows ash and soot, volatile oils and greases, sulphur, bacteria and pollen. In the dustless home of tomorrow it is anticipated that annual cleaning of wallpaper and frequent washing of curtains and rugs will be eliminated. In a test of the electrostatic system at Pittsburgh, curtains remained clean for months. It is expected to aid patients suffering from asthma and hay fever, for pollen is elimi-

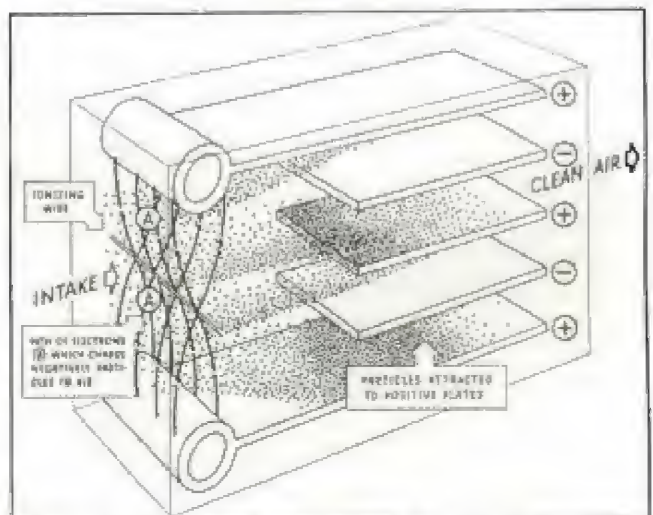


Diagram shows how dust entering at left is ionized by electric wires then caught on high-voltage plates

207 Wachter Drive
Chicago

nated, and even bacteria. In one experiment, two types of bacteria were sprayed into the air, averaging 650,000,000 to the quart of air; after passing through the air cleaner a test showed only one micro-organism to the quart of air. The current cost of operation is low, a unit for the average home requiring about as much current as a sixty-watt lamp. A particle of cigarette smoke is about four millionths of an inch in diameter. Billions of them are blown into the air with every puff. But they are not too small or too numerous for the electric dust magnet to tackle!

Tame Deer Lives in the House With Family's Pet Dog

Raised by the family since it was found near by two years ago, a deer lives in a New Jersey home, as much a pet as the



Tame deer eating out of a dish placed on shelf of the kitchen cabinet

dog. Each afternoon the deer and the dog take a nap together. But at mealtime, the deer either eats from the table or rears on its hind legs to reach a saucer of orange marmalade placed on a high shelf.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.

Hot-or-Cold Pack Holds Water for Making Ice



Ice pack in use. Note how ice is frozen in separate compartments in pack

Made of rubber sealed to hold the water to make ice cubes, the latest ice pack is handier to use than many of its predecessors. The ice is made by putting the pack into the freezing compartment of a refrigerator for about forty-five minutes. Placing the pack in hot water prepares it for use as a hot pack. No refilling of the water compartment is required.

Hand-Pushed Bicycle Scooter Is Steered by Foot

There's room for one passenger and a pup on this two-wheeled scooter. The youngster, seen on a beach in Belgium, steers her "bike" with her feet and propels it with the sticks held in her hands.



© Planet News, Ltd.

Speaker Sees Own Voice in 'Test Tube' Mirrors



Both teacher, at left, and speaker can "see" latter's voice through tube containing maze of mirrors

You can not only hear yourself talk, but also see your own voice. A "test tube" invented by an Italian makes it possible to test the speaking voice by watching it in action. The long, slender metal tube contains an intricate maze of mirrors. It is inserted far back in the speaker's throat to "focus" on the vocal chords. On its under side is a pinhead opening, and at the tip are two tiny electric bulbs furnishing a strong light. A vocal student can peer into one "finder" to watch his voice, while the teacher observes through another eyepiece.

Railway Cars Sent into Collision for "Crash Test" of Strength

Crash tests for fully loaded railway cars are giving engineers a practical demonstration of the strength or weakness of rail equipment. Both passenger and freight cars, loaded to a weight of eighty-four tons on the rails, are sent into collision while instruments installed at 120 points on the tops and sides measure the strains

developed by the crash. The new type lightweight running gear is also given a breakdown test on a special axle-testing machine. A speed equivalent to eighty miles an hour on the rails is maintained until the axle breaks, and good axles stand up for 200,000,000 revolutions, or the equal of a half million miles of travel.

Teletype Board for Football Aids in Announcing Game

Keeping up with the football game is made easy for the radio announcer by a teletype machine which flashes the names of players as they carry and pass the ball or make tackles. The machine consists of a sending and a receiving unit linked by flexible cable. The sending unit, in front of an observer, has twenty-two push buttons for the names of players on the two teams. As the observer presses a button on his board, a light flashing on the announcer's receiving unit indicates the name of the player handling the ball or making a tackle at that particular moment. Thus the announcer may concentrate on the play as the names of players are flashed before him. The observer's job consists of memorizing the players' names and numbers and following the ball on the sending board by touch system as he picks up the numbers on the field through field glasses. The machine was constructed by engineers of WBBM, Chicago.



Observer following ball with aid of glasses and pressing buttons on teletype board

Cub Hal Burnett
Columbia Broadcasting

Hill-Climbing Tractor Pulls Skiers on Big Sled



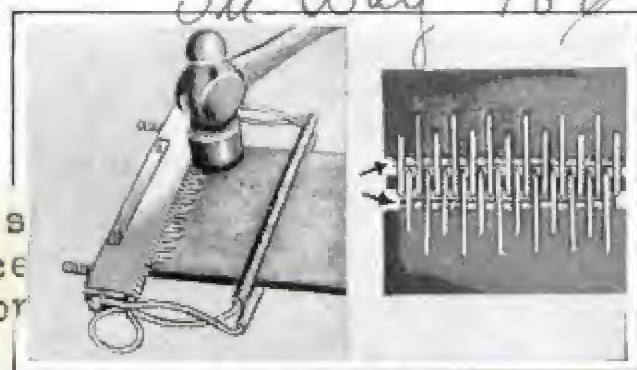
Ski party boarding twenty-five-passenger sled for ride up mountainside behind tractor. In front view at right, notice single track made of angle irons which grip snow



Modern counterpart of the old-time hay-rack ride is the motorized snow sled for skiers. A single-track tractor was developed by the U. S. Forest Service to haul parties of skiers up the slopes of Mt. Hood in Oregon, and a similar "Sno-motor" and sled is being built for winter sports at Sun Valley, Idaho. The power unit is a four-cylinder heavy-duty gasoline engine mounted on a track consisting of angle irons with one side projecting to bite into the snow. A flat steel plate over the track spreads the weight uniformly so that pressure on the snow is only twelve ounces per square inch, about the weight of a man on snowshoes. The tractor has several forward

ward speeds ranging from one to twenty-five miles an hour; it can climb forty-degree mountain slopes and turn in a thirty-foot radius. The flat-bottomed sled carrying twenty-five passengers has guiding runners on each side and in the center extending several inches down into the snow. These furnish resistance to permit the operator to steer the tractor.

Belt-Lacing Tool Inserts Hooks with Hammer or Vise



While jaws hold belt in position, hammer drives hooks in to form the laced joint seen at right

Either a hammer or a vise can be used to apply hooks in lacing belts with a tool now available. The hooks are supplied in strips and cut to the required width to fit the belt, then inserted in a magazine. The belt is placed between spiral spring-pressure jaws and pushed firmly against the magazine. The hooks can then be driven into the belt either with hammer or by tightening a vise. The tool is particularly useful when a belt must be laced away from a shop.

Safety Belt Lacer Co., Toledo, Ohio



SLED THRILLS

Top, spectators line the curves to watch the bobsled whiz by. Bottom, four-man bob taking a sharp turn



and timber and must weigh close to 500 pounds. The driver examines the steering wheel while the man in the No. 4 position tests the saw-tooth brake. The place directly behind the driver is assigned to you. It is the safest spot and besides, your weight can be used to advantage there. As you place your feet on the footrests and your hands in the straps at the sides, the steersman announces that, owing to your inexperience, the running start is to be precluded. Then the man in the control tower gives the starting signal.

"Track clear,"

"Ready——go!"

Slide attendants push, and down the snow and ice-packed runway streaks the bobsled like a meteor. As Eyrie, the first

YOU are ready to take your first bobsled ride down the Mount Van Hoevenberg run at Lake Placid. A sinking sensation wells up within you as you gaze down the mile-and-a-half course with its twenty-six turns.

You adjust your crash helmet and goggles as the sled is placed at the starting line. It is a massive contraption of steel

*Schreiberhaus in Asiatic
mountain es 964.*

major turn, nears you realize that you are experiencing the most thrilling form of rapid transit known. The proximity of the earth and the blurry scenery intensify the sense of speed. The bob hurtles on to Whiteface, fashioned in the shape of a hairpin and named after majestic Whiteface mountain. Here the sled climbs a wall of ice, almost at a right angle to the ground, to take the course beyond at a beautifully accurate pitch.

At Cliffside, the next turn, you feel your neck snap backward and your heart do a flip-flap. Diving out of Cliffside onto the straight-away, the brakeman on a signal from the driver barks:



By SLIDE RULE



Top, up a wall of ice on a run in Germany. Bottom, building a run by laying ice squares on the turns. Course is watered to freeze the squares uniformly



other speed spurt. Now the bob is traveling at a terrific clip; the wind is knifing your leather jacket and the snow is hot sand against your face. The sled's progress is reported from the control towers to the crowd over loud speakers. Famed Zig-Zag is the final breath-catcher. It is a double reverse bend, the supreme thrill. From the straightaway the bob hits Zig, the right bank, and from here skims on through two more curves

before passing the finish line in a miniature blizzard as the brakes are applied.

The ride of a lifetime!

Physical science, mathematics and construction engineering have contributed to the development and safety of this pulsating sport. So perfectly designed are the great slides that a riderless bob can negotiate them without upsetting. By no stretch of the imagination is bobsledding a juvenile sport. Mature individuals of sound physique and steel nerves are required to pilot the bobs. When the German four-man team lost control on the Lake Placid run a few years back, its sled jumped com-



"One—Two—Bob." This, you remember, is your cue to ease back with the two crew members behind you and then sit up forcefully, thus giving the sled extra momentum.

Shady Corner looms ahead. It is a twenty-two-foot turn that angles to the right. The driver enters it high and comes down the bank fairly early. Again the command is given to bob. An-



Top, whizzing around a turn. Center, run in summer, devoid of ice. Bottom, hairpin turn tests skill of the championship bobsledders



Courtesy German Railroads

pletely off the course, flew 110 feet in the air and landed in a forest. Three members of the team suffered assorted fractures, the fourth a serious back injury.

Such accidents are a rarity, however. Approximately 10,000 enthusiasts taste of the thrills of



Top, watching sled take a curve. Center, putting final touches on bob run. Bottom, engineering skill makes possible the thrill of high speed on the big runs

bobsledding yearly at Lake Placid and only minor spills have occurred during the time the run has been operated by the Conservation Department of the State of New York. Manned by competent drivers and brakemen, the sleds are equipped with saw-tooth brakes, capable of bringing a sled to a complete stop within seventy feet even at top speed.

There are approximately

(Continued to page 120A)

POPULAR MECHANICS
Shatterproof Glass for a Light
Withstands Blows and Heat

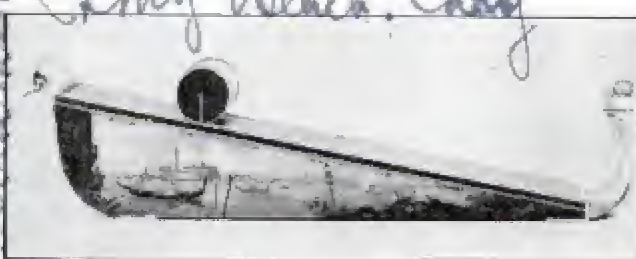


Hammer strikes blow after blow against glass of industrial lighting fixture to prove it won't shatter

To demonstrate its ability to withstand heavy blows, a shatterproof glass developed for industrial lighting fixtures was struck time after time by a hammer at a recent business show. The glass not only endured this punishment without shattering, but stood up under a heat-resistance test in which Dry Ice was applied to one side of the glass while molten solder was splattered on the other.

Cylinder Clock Sliding on Incline
Tells Day of Week and Hour

Popular more than a century ago because of its mysterious working, a cylinder clock moving down an inclined plane told the time and the day of the week. The hours and days were marked along the edge of the incline, and a needle attached to the metal cylinder indicated the time.

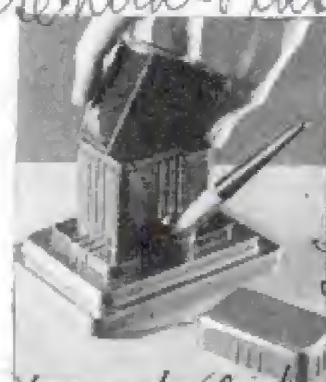


Seven-day clock tells time as the cylinder rolls down incline. Days and hours are ruled along side

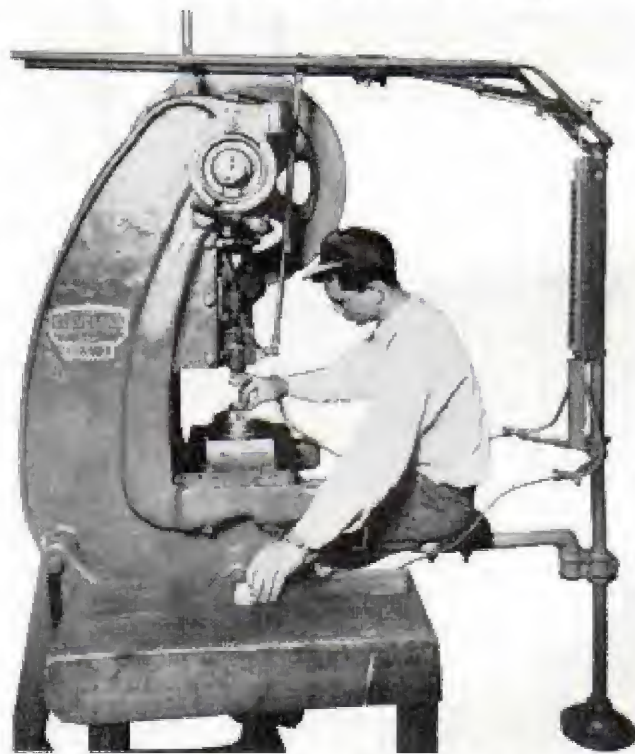
The actuating mechanism was a watch movement inside the cylinder, with a weighted lever driven by a main spring. The principle of the weighted lever used in timepieces was patented by a French inventor in 1593.

Latest Inkwell Saves Ink
from Drying Up

Made of acid-resisting plastic to withstand the action of ink, a new inkwell prevents ink from drying so rapidly. A special feed bottle is inverted in the well, feeding into the pen as required.



Safety Cuffs for Operator of Press
Pull Hands Out of Danger



Cuffs with attached cables snatch away operator's hands before press closes

Handcuffs of leather which snatch away the worker's hands as the press starts downward make it impossible for the operator to get his fingers caught. A visit to almost any large industrial plant, where many of the workmen exhibit hands with scars and perhaps a finger missing, dem-

es 1153

es 1143

es 350

es 1106

convention of asen. demand
 of led engineers 435-440
 Chicago

es No 4.

Cont. Mrs. Elbel R
 Adams Box 705
 Long Beach, Calif

Swiss watchmaker is
 in London.

E.A. Whitacre
 14408 Pershing Ave. N

Chicago Inkwell
 53 W. Jackson
 5700

Mechanical Corn Harvester Picks Ears from Two Rows

onstrates the value of the safety cuffs. Forcible withdrawal of the pressman's hands from the danger zone is accomplished by cables attached to the handcuffs. Speed of the apparatus is adjustable to that of any press. The cuffs have broad leather bands that fit around the wrists and small straps that fit between thumb and forefinger to prevent the wristbands from slipping up the forearm. When a new job is placed on the press, the foreman adjusts the speed of the handcuff cables and the distance of the withdrawal.

Pump Sucks Smoke Out of Burning Building

Clearing the way for firemen to combat flames, a vacuum pump sucks smoke out of burning buildings. The machine, with long hose attached, is lowered into a



"Vacuum cleaner" sucking smoke out of burning building is shown in demonstration

smoke-filled basement, or other part of a building, and the pump is started. Quickly the smoke is withdrawn from the basement, enabling the firemen to approach the flames without the risk of being overcome by smoke and fumes.



Working on two rows at a time, this mechanical corn picker harvests 800 bushels a day, squeezing ears from stalk and loading them into wagon

Cleaning up a cornfield is a fast job with the latest mechanical corn pickers, which handle two rows at once. The corn is forced between two rollers which squeeze off the ears and drop them on an elevator which loads a wagon. The average farm hand can pick sixty bushels a day. This mechanical picker harvests 800 bushels a day.

Swivel Base Socket for Light Permits Change in Focus

Electric lights used in a new swivel base socket may be focused in any direction at a touch of the hand. The socket has a bellows-like base, permitting the light to be turned in the direction desired. The manufacturer claims the socket is built to last throughout the normal burning life of approximately twenty lamps.



Handseye Electric Co.
100 E 42nd St New York

Adm. John Lowell, Caldwell, Cal.

ls 1128

no infer. 12/28/37

ls 1102

es 9.7.9
Cmbr Philip Bailey.
12.21-5th Ave
Los Angeles Cal



Thrilling scene from the Twentieth Century-Fox production "Ali Baba Goes to Town"

PACKING DRAMA

THRILLS always have been the backbone of motion pictures. A pioneer director tells of how his company once heard of a big fire raging on a near-by street. They rushed to the scene. Somehow the performers managed to get past the police lines. As the cameramen ground away, the players hustled in and out of the burning building. The director viewed these scenes in the projection room and set his writers to work weaving a story around them. After taking a few additional scenes on their lot they had a movie. Thus many early movies were made.

Adding thrills to pictures is still an important business, but it is now done with careful planning. Dangers to life and property are cut to a minimum. Stunts have been worked out with miniatures and

camera tricks that would have bewildered the old timers. For an effective background for "In Old Chicago," Twentieth Century-Fox built a prop city of six square blocks. The set was isolated because setting many of the buildings ablaze to represent Chicago's fire created a fire hazard.

Ten truck loads of steers were hauled to the studio for a sequence in which they broke out of the stockyards. The fence was weakened where modern cowboys, working out of the camera's range, chased them through. To get close-up shots of the steers Cameraman Jack Young hid in a pit with two cameras. Toward the end of the stampede the boards began to crack and had him worried for a few minutes. As in many stunt scenes the cameraman often takes a greater risk than the players.



in the FILMS

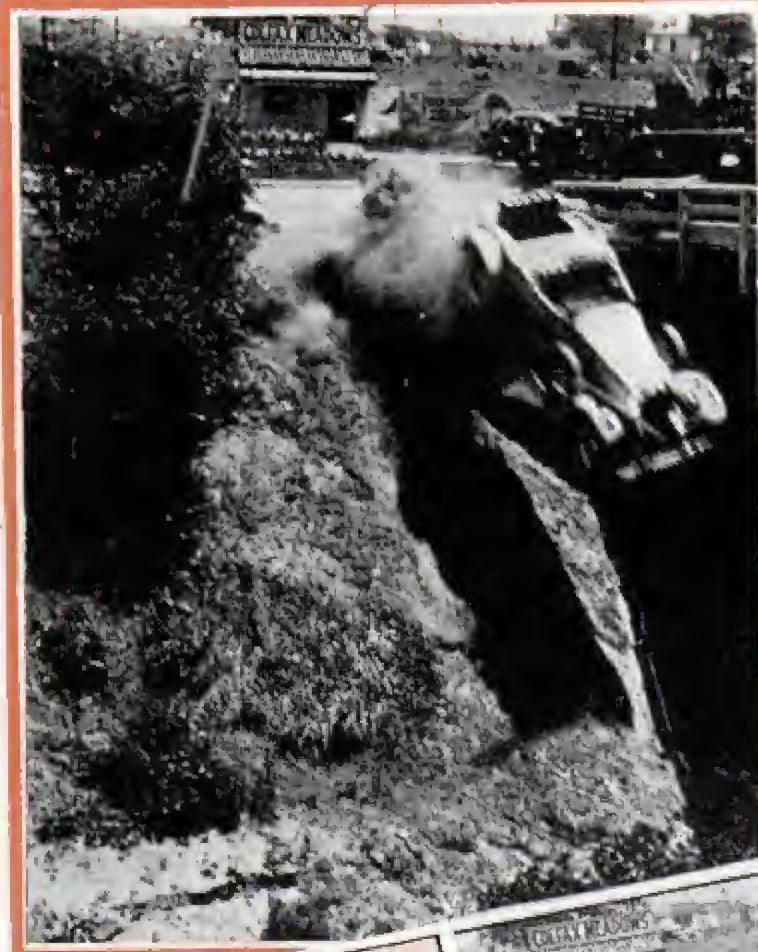


Right, fighting fire in "In Old Chicago." Left, top and center, spraying liquid smoke around prop mill and over vat of "molten metal." Bottom, mixing liquid smoke

Fire-fighting scenes usually make the movie audience's hearts go pit-a-pat, but they are dangerous to film, although every major studio maintains its own fire department. To reduce the fire hazard, men in the special effects department have worked out tricks in producing artificial fires. Liquid smoke, like that used by navy fliers to hide a battlefleet, is the basis of many modern movie fires. Lights out of the camera's view play on the rising smoke and this photographs like real flames. Electric fans are used to move the thick smoke rapidly.

A Bessemer converter belches sparks high in the air. A great vat of molten metal boils over with a roar. Flames shoot out of a furnace door at a fireman. It looks like a real steel mill, yet it is only a prop setting for Universal's "Radio Patrol." The special effects and property departments spent weeks planning and building it. Wood was the principal material used. To obtain the effect of boiling metal a mixture of lye, water and aluminum was placed in the vat. Before every scene a property man

C. & Brown, 'Special Effects man'



catches a stunt man toppling backward, but he only goes back so far and there the film is cut. Next a dummy of the policeman is dropped from the top of the sound stage and the camera catches its fall. Then these pieces of film are connected with a view of the real player, acting as if he were nearly dead, on the railway tracks below.

Most dummies are made from soft rubber. They fall more realistically than those stuffed with sawdust, used in the old days. An actual life cast of the player whom the dummy is to represent is made from rubber.

For a scene in "Love Under Fire," twenty stunt men were asked to jump off a freighter into



*Stuntman
Jack Woody*

Top, roadster flying through the air. Center strip, left, wiring and priming car to explode and burn. Center, sedan crowding roadster off road. Right, camera catches roadster's crash and then the fire

sprayed smoke around the furnaces with a liquid smoke can, which looks like a big coffeepot with bellows attached.

Fights on the edges of cliffs and on skyscraper roofs are popular. A policeman is seen toppling backward off a girder, then falling through space and finally trying to move his crumpled body from a railroad track. How is it done? First the camera



Another camera view of the sedan after it crowded roadster off bridge

Los Angeles harbor and stage a battle for the possession of a lifeboat. Stunt men usually fight with open fists to avoid injury to opponents. Fist fights between movie stars are rather slow, but the camera is raced to make them look exciting.

The secret of taking a fall with minimum injury, according to stunt men, is the ability to keep the body relaxed until the impact. This applies to falling off boats as well as off horses. If one lands in the sea on his back after a thirty-foot fall he may break his back.



Top, stunt man toppling off ship after fight before the camera. Center, left, rubber dummy of policeman hanging from top of sound stage. It will be dropped when cameras are ready. Right, actor crumpled on rails after apparent fall

Horses don't like the idea of falling any better than humans. Cameramen would have a long wait to catch a horse stumbling. But movie directors have tricks that will make a horse fall. One of these is the "running W." They hobble the horse's front feet. A thin wire cable connects the hobble and a stake some distance away. When the horse runs the cable's length he automatically falls, throwing his rider. This stunt is usually done on the desert sands or on soft, grassy earth to save the

(Continued to page 144A)



Bottom, cameramen and director in perilous positions high in rigging of ship, ready for filming another thriller of the sea

Radio Patrol

Harvey Perry

'Bird Cage' Walnut Picker Makes Harvesting Easy



Picking up nuts with "bird-cage" harvester. Inset shows triangular springs that grasp walnuts

Gathering walnuts without inflicting a lame back is the purpose of a special walnut picker designed for the small orchard man. It is a cage made of galvanized wire and mounted on the end of a pole so that stooping is unnecessary. A triangle of three small coil springs picks up the nuts and they are removed through a small door in the side of the cage.

Wheel Tester Blinks Neon Eye If Wheel Is Off Balance



Winking its neon eye as a warning signal, a wheel-testing machine gives precise indication of any unbalanced condition in the wheel. A motor drive puts the wheel in mo-

tion and accelerates it to the vibration point, then releases it and the neon light is switched on. As the wheel revolves, the eye flashes, indicating at what position the wheel is dynamically out of balance. After the wheel is completely balanced both statically and dynamically, it can be run at the highest speed obtainable without making the neon eye blink.

Phone Message Parked on Tape Is Repeated After Delay

It may soon be possible to "park" your telephone message on a magnetized steel ribbon until the proper party arrives to receive it. In the Bell Telephone laboratories, engineers have succeeded in parking messages for a short time on a thin steel tape which is passed between the poles of two small electromagnets at a speed of one foot per second. The speech current, flowing through the magnet windings, produces varying magnetization in the tape, and as the ribbon passes between the poles of a second similar pair of mag-



Magnetized steel ribbon on which telephone message is parked until repeated on loudspeaker

nets several feet away, it induces in their windings currents corresponding to the magnetic pattern and thus to the original voice current. The words are repeated five seconds later by a loudspeaker. The tape can be used again after the magnetic pat-

Dear Wm Co Rock Island, Ill

463 West St
New York

Es 1180

\$2.00

Es 1165

tern is removed by passing it through a strong and varying magnetic field. During experiments made thus far it has been possible to delay delivery of messages only a brief period, and no attempt has been made to put the method to actual use.

Gas Mask Guards Fireman from Smoke

Protection of firemen against their nemesis, smoke, is afforded by gas masks. Now used as standard equipment by some fire departments, the mask enables the fireman to reach the source of the flames. Smoke has claimed the lives of many firemen attempting to get into strategic position to combat fire, in addition to overcoming many others.



Fireman wearing mask for protection against smoke is shown entering burning building

Army Tank Takes to the Air in Jumping an Embankment



Quick eye of camera catches fifty-mile-an-hour army tank in the air as it hurtles over embankment during maneuvers in Pennsylvania

One of the army's new light tanks was caught "on the fly" by an alert cameraman as it leaped an embankment at high speed during maneuvers at Indiantown Gap, Pa. These tanks, just adopted by the U. S. army, can travel at fifty miles an hour. They carry three machine guns and two-way short-wave radio equipment.

Cows Are Now Wearing Rubbers to Avoid Spread of Infection

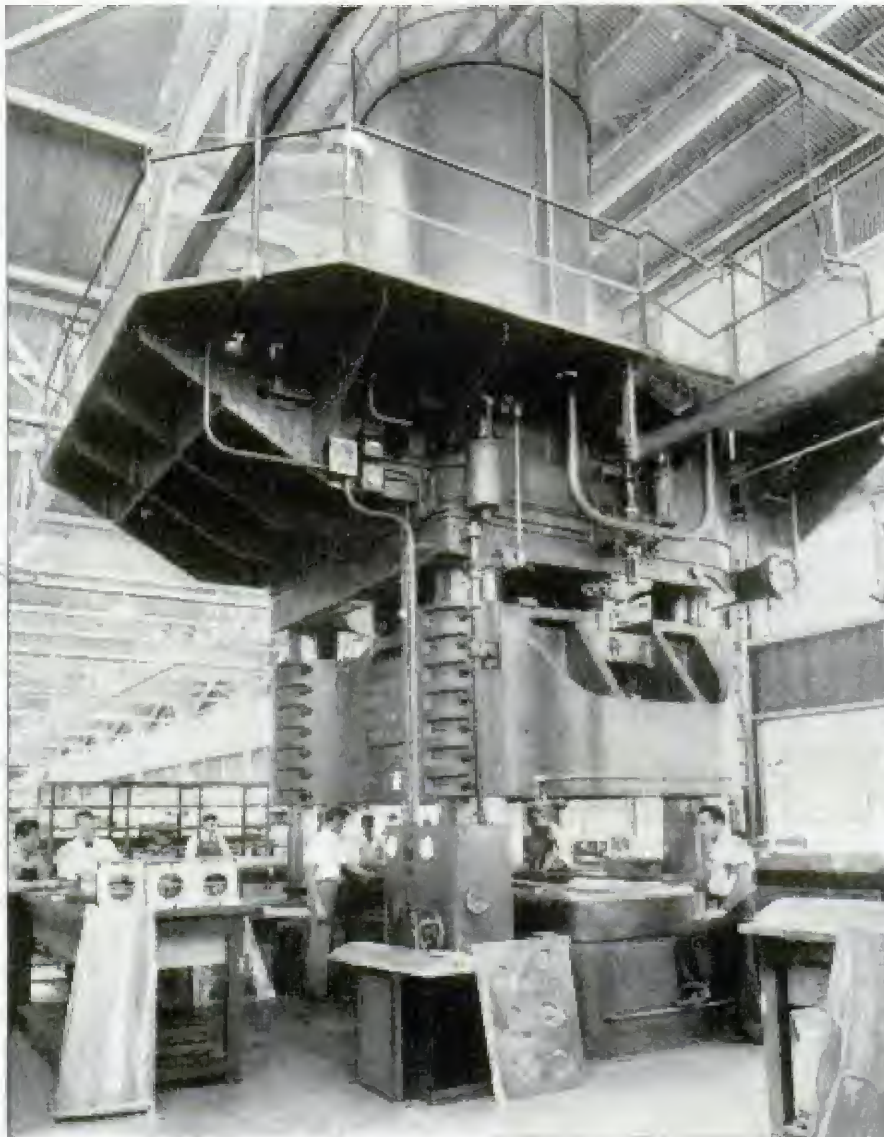
Rubber galoshes are now the thing for cows. It's a matter of health, not style. The rubbers were developed to prevent the spread of infection among cattle suffering from hoof diseases. Similar foot coverings had previously been tried on sheep and had resulted in a considerable saving of losses to farmers.



Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

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Giant Press for Plane Parts Speeds Up Aircraft Building



Here is the giant press in place, ready to stamp out airplane parts quickly to speed up production of air liners. It is four stories high

For increasing production of airplanes, the Douglas Aircraft company has installed a four-story, 420-ton hydraulic press which will shape several thousand kinds of parts. Completely self-contained, the press has a pressure capacity of 5,000 tons created by a single hydraulic ram six feet in diameter actuated by oil under a pressure of 2,500 pounds per square inch. The hydraulic pressure is generated by four giant radial pumps driven by two 150-horsepower electric motors. Covering as much floor space as the average home, the press is set into a special foundation of reinforced concrete. In order to move the press into the Douglas plant, it was necessary to tear away the front of the building and disman-

tle part of the roof. Shaping of the parts on this big press, and a smaller one installed sometime ago, has resulted in a reduction in tool costs, as much as twenty-five to one, over conventional requirements. The parts are all of aluminum alloy.

Fountain Pen Lamp for Soldering Gives Quick Heat

Blue flame hot enough to melt brass or copper is obtainable with a pocket soldering lamp invented recently. Burning methylated spirit, available anywhere, it reaches a maximum heat of about 2,650 degrees Fahrenheit within fifteen seconds. The little lamp consists of two cylinders, the "heater" and "carburetor," containing wicks and a supply of spirit to last nearly an hour. A few seconds after lighting the "heater," a gas flash blows at great speed and pressure from the side of the "carburetor" cylinder nozzle, becoming a torch of blue flame.



Pocket soldering lamp produces blue flame under high pressure, hot enough to melt copper or brass. Upper cylinder is "carburetor," lower is "heater"

Tractor Helps Raze Building from Top Down

Top, tractor pushing debris over the side. Center, building in process of being wrecked. Bottom, lowering tractor to another floor



Among the novel jobs on which Caterpillar tractors have been used is that of wrecking a building from the top down. A Diesel-powered tractor was hoisted to the top of a seven-story building in San Francisco and used to push debris over the side after the walls had been knocked to pieces by a crane swinging a heavy ball. As each story of the building was wrecked, the tractor was lowered to the next until the entire structure had been demolished. The work was done to make way for a new building.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.



Private Plane Has Shower Bath and Comfort of Yacht

Furnished like a commodious yacht, with luxurious accommodations for thirteen passengers and a crew of three, a four-motored flying club plane is to be built for a California sportsman. It will cost slightly less than \$300,000. There will be a shower bath, a dining room and galley with a refrigerator, a lounge, a master bedroom with hot and cold running water, and bedrooms for four guests. The giant land

plane is being designed after the pattern of the new four-engined transport ships which carry thirty-three passengers, but its special interior design reduces its accommodations to thirteen daytime passengers and beds for seven, besides the crew. Its wings measure 107 feet from tip to tip, and the plane will have a speed of 250 miles an hour.

Es 1228.
Garrett Co.
Boeing
Seattle, Wash.
County, Calif.
Capt. George Whitell
San Mateo

Roadside Figure of Death Warns Fast Drivers



This grim warning of Death the Hitchhiker may be used in road safety campaign

While a photographer sought to get a roadside picture symbolic of the Grim Reaper waiting to be given a lift by a passing motorist, he noticed that the figure of Death in hitchhiking pose had a sobering effect on drivers operating their cars above safe speeds. Now it has been suggested that a man in the same costume tour the state as a warning against careless driving.

Plant Growth Aided by Light from Low-Wattage Lamps

Using lamps of low wattage, Dr. R. B. Withrow of Purdue University has found a method of forcing the growth of plants in greenhouses. The Smithsonian Institution reports the lamps were employed as supplementary lighting sources for a number of plants and the results apparently were out of all proportion to the treatment applied. With the intensities varying from less than one foot-candle to more than 100 foot-candles, the lamps illuminated the

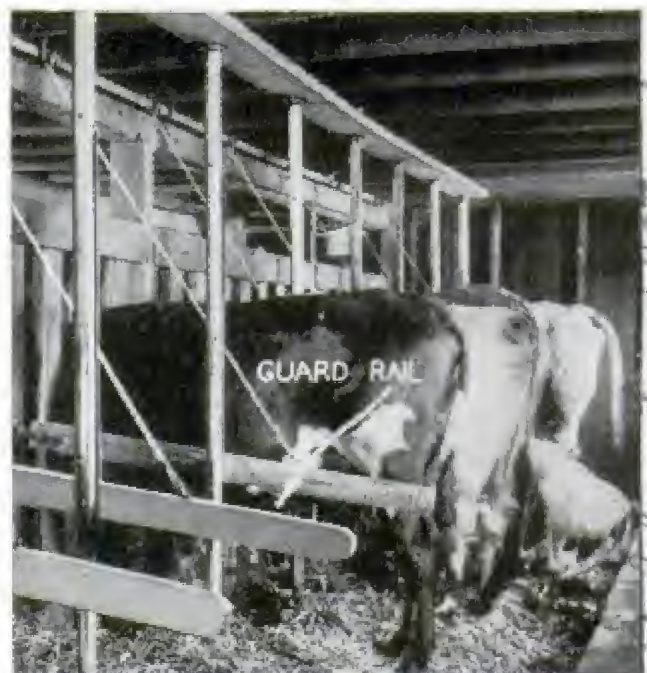
plants for several hours each night. This light supplemented the natural light of day. Surprisingly, an aster receiving 100 foot-candles and another receiving three-tenths foot-candle showed little difference in flowering.

Arc-Welding Shop in the Arctic Saves Mine from Shutdown

Even in the arctic, far from commercial electric-power lines, electric arc-welding has become a necessity. It came to the rescue recently when a mine in a remote section of Alaska was threatened with a shutdown because of a broken gear wheel. Eskimos loaded the broken wheel into a skin boat and paddled for five days to reach the settlement of Candle, where a gasoline-driven arc-welding outfit was available. In three hours the repairs were completed and the Eskimos started back.

Folding Bars Form Stalls for Cows in Dairy

Designed to prevent cows from trampling each other, a folding guardrail partition forms an individual stall for each animal in the dairy barn. While the cows are being milked all the bars are raised out of the way. Then the bars are lowered by one movement, giving each cow the protection of a stall.



Guard rail in place after milking. It reduces the danger of cows trampling each other

es1101

Los Angeles Calif.

Odd Puzzles Are Created by Secret Process

Puzzle maker, right, with several examples of his mystifying work. Note size of puzzles in comparison with that of the small-necked bottles and electric-light globes



Wooden and metal objects in bottles with necks too small for them to be removed are among the puzzles prepared by a western puzzle maker. Calling them "engineers' problems," the puzzles are made by a secret process. The bottles are ordinary glass picked up at random, the bottoms have not been removed and melted back and the usual "ship in a bottle" method of assembly has not been used. One of the pieces is a large power base electric-light globe from which the base is removed and that contains three solid circles of wood that almost completely fill the interior of the globe. A pickle jar, in addition to a bulbous wooden shape inside, also contains a large metal washer far too large to have been inserted through the neck. In a third bottle a wooden dumbbell appears to have grown inside. It has one end projecting through a small hole cut in the metal cap. Another puzzle is a solid seamless metal ring placed on the crossbar of an "H"-shaped piece of wood, seemingly impossible to accomplish without welding



on the ring or joining the wood. There also are wooden dumbbells encircled at the middle with small rings made from other kinds of wood. Closest inspection of the objects fails to reveal the manner in which they were made.

Plane Drops Food to Climbers Scaling Mountain Peak

Airplanes dropping food and supplies replaced the long string of laboring porters during the conquest of Lenin peak, in the Pamir range of Asia, whose 23,700-foot peak was scaled recently by eight Russian mountain climbers. Radio kept the climbers in communication with their base.

Science Service

9/17/37

Cont. Thomas G. Higgins
Jan. 1935
Los Angeles, Calif.

DISPATCHING

Dispatcher Mason on the job, keeping 1,200 tractor-and-trailer units moving. Below, driver signing maintenance card after checkup at the terminal



ONLY a few short years ago the trucking industry was considered the puny step-child of other forms of transportation, a sort of poor relation which existed on the short-haul crumbs which the more prosperous carriers contemptuously refused.

Today motor transports handle one-tenth of the nation's tonnage and trucking has become big business, a wide-awake competitor for every pound of freight to be hauled, a lusty, tough youngster in the transportation field with a rich lingo of its own, a language as picturesque as the sailor's or railroad brakeman's.

In the argot of the trucker, explains Jimmy Mason, chief dispatcher at one of the world's largest trucking terminals, a tractor is a horse; a refrigerated trailer a reefer, and perishables are hot stuff. To the cross-country driver a mechanic is a knuckle-buster; a magneto a jolt box; any trucking unit a corn popper, and a tourist camp a curfew park.

Although a wealth of trucking expressions reach his ears nightly, Mason never gives them a second thought. He's too busy

keeping 1,200 Keeshin tractor-and-trailer units moving over the highways of eighteen states, six nights in every week. Competition in the transportation field is tough. Apart from the railroads, there are between 3,000 and 4,000 trucking companies bidding for business, and rigid schedules must be maintained by both big and little operators in order to survive.

It takes brains and courage to herd the behemoths over the concrete on schedule. Through snow and dust storms, sleet and washouts the truck drivers battle to deliver their freight. They must cope with fatigue and the perils of the highway, the drunken or careless motorist, an occasional high jacker, and sometimes cattle from unfenced lands. The truck driver has a philosophy all his own. He's too smart to laugh at the dangers connected with his

es 1159

Trucksteell equipped trucks

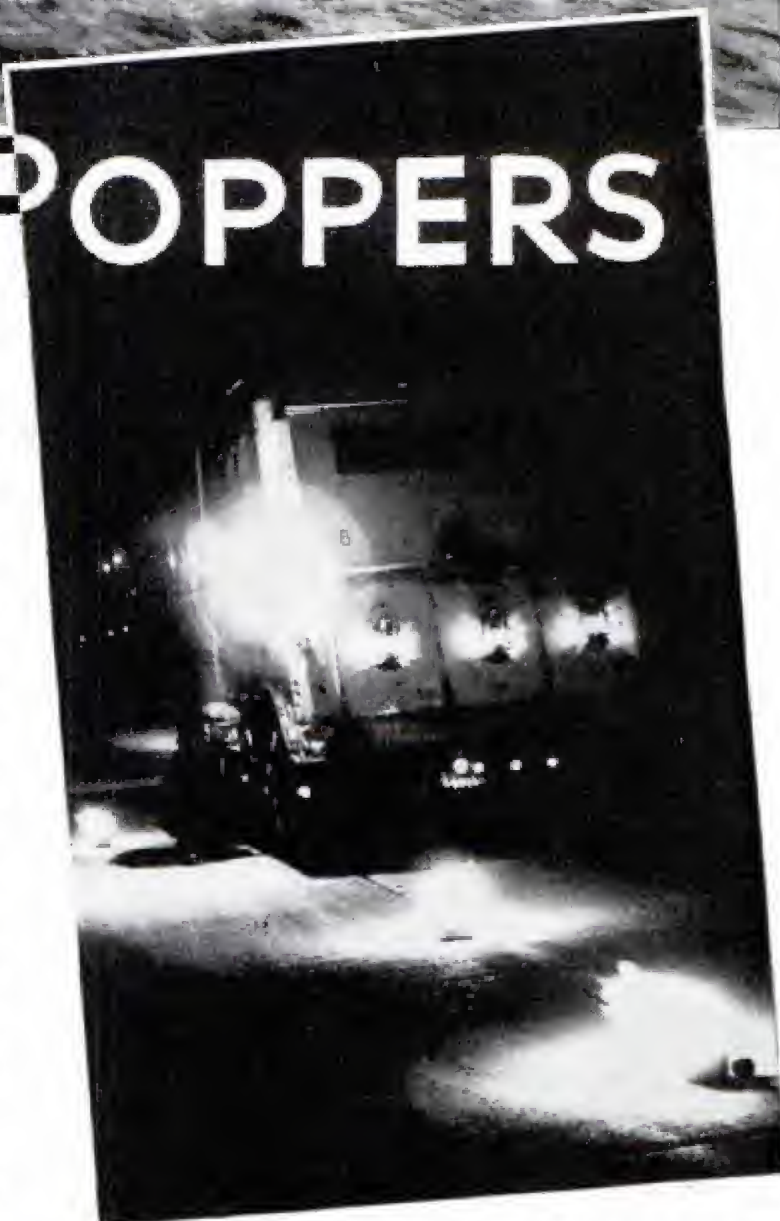
Quinnell River in
Washington



CORN POPPERS

job but his alertness and bravery make him equal to them at all times. The safety of others is his first consideration—no chance is too great for him to take in avoiding a highway crash. And whenever a driver goes the limit he either escapes without injury or else he's sent home in a wicker basket.

The experience of a California driver on the Sacramento-Reno run is characteristic. Traveling down a steep, winding road from Donner Summit to Truckee in the High Sierras, a United Freight driver, after negotiating a blind turn, came upon an ice-sheeted stretch of highway. An old model touring car was stalled broadside across his path. Seeing five persons in the car, the driver, with a quick turn of the steering wheel, sent the twenty-ton truck hurtling off the road into a canyon. Down a 150-foot ravine, the truck toppled. Motorists hurried to the spot a few minutes later and found the unit a wreck. But the driver



Top, big truck crossing river with 5,000-board-foot log. Bottom, flares and bomb pots warn other drivers when truck halts at night for repairs



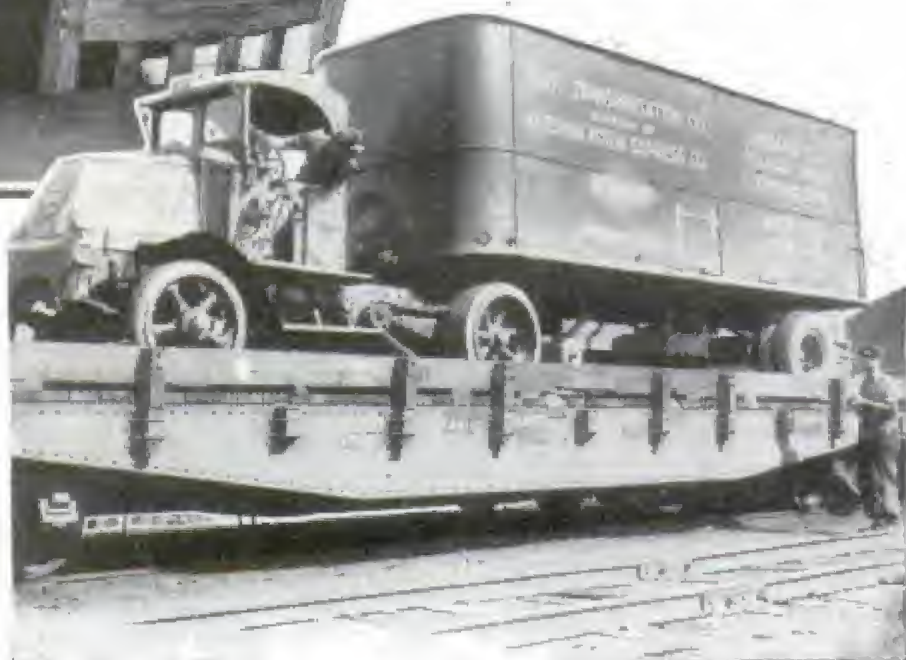
Top, these assistant dispatchers handle fleet of city trucks that deliver freight to terminal. Bottom, sometimes loaded trucks are put on flatcars and shipped by rail because no better service can be offered by highway

was still behind the wheel with only an ashen complexion and a small bump on the head to show for his experience.

No less thrilling was an episode in the life of a Sacramento driver engaged in transporting gasoline from a storage depot to a town near by. The highway in front of the loading depot sloped downward with a small stream running parallel to it. His truck loaded, the driver started down the road at a snail's pace as he had agreed to wait for the two drivers behind him at a coffee station at the foot of the hill. The truck had gone but a short distance when the driver noticed things were growing blacker. He looked back and saw the sky a bright red. The gasoline depot had caught fire and the flames were rushing down the highway toward his truck with alarming swiftness. He pressed the accelerator to the floorboards. When the flames were outdistanced, he learned there had been an explosion and the burning gasoline from the storage tanks had spilled into the creek running alongside the highway, making it a roaring stream of fire.

Highway maintenance departments have taken the sting out of snowstorms in most sections. In the mountain regions, the heavy snows are still productive of freak

accidents and grief for the motor carriers. A noteworthy one happened on Donner Summit last year. Between ninety and 100 inches of snow within a week's time is not uncommon in this section and that means man-sized drifts. The highway workers had battled half the night in a



raging blizzard with the temperature at thirty degrees below zero trying to carve a roadway through the expanse of snow. Even the snow poles that served as guides for normal drifts were blanketed and the workers were cutting it from memory. On a winding curve, the plow had cut beyond the shoulder of the road but nothing happened. The hard-packed snow beneath it held.

The first truck through—a 60,000-pound Diesel—wasn't so fortunate, however. As soon as it hit the snow part, it went sliding down the mountain in toboggan fashion. The unit came to a halt in the valley and the driver and his "swamper" got out to inspect the damage. It was negligible, considering the distance the truck had traveled, but it was three weeks before the unit could be extricated because the storm continued and the drifts covered it.

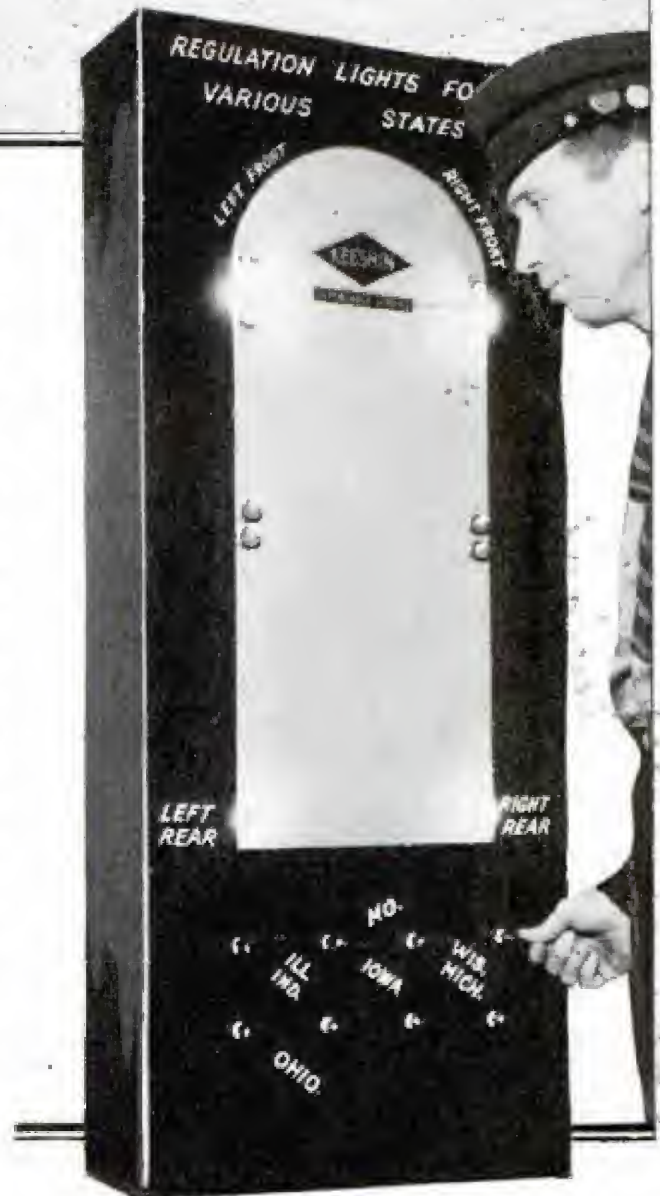
Storms that bring the greatest grief to the truckers are those which occur in sections that are not prepared to handle them.



A heavy storm in the vicinity of Cedar City, in southern Utah, caused a five-day tie-up of the trucks along the Utah Hill. Many of the drivers left their motors running for five days straight while they helped battle the drifts.

In the early evening hours, the big motor-freight terminals present a vivid picture of the magnitude of this baby among industries. At one of the large ones, between 3,000 and 5,000 shipments—a million and a half pounds of freight—are placed on the docks to be loaded into the trailers that will make deliveries in 300 cities the following day. Everything from pretzels to steel hoists is handled. Running orders and the freight manifest are handed to each driver by the chief dispatcher. When going into a new territory, the driver must acquaint himself with the special regulations peculiar to that section before leaving the terminal. For example, in Michigan, a driver must keep an accurate mileage book showing how many miles the trailer has gone. Likewise, state laws differ in regard to clearance lights. To expedite matters, an ingenious lighting board has been developed in the Keeshin shops. If a driver turns a switch on the panel marked "Ohio," the board flashes a green light for the left front; red lights for each

(Continued to page 140A)



Top, driver gets final checkup on tires, brakes and lights before leaving the Chicago terminal. Bottom, by turning switch a driver can tell what clearance lights are required for various states

Keeshin

Giant Aircraft Carrier Mothers 140 Planes



Sub.
"Mother" to a brood of 140 or more warplanes, the U. S. S. "Yorktown" is the navy's biggest aircraft carrier and cost \$20,000,000. Notice its long sweep of unobstructed deck, a flying field 800 feet long

First of twin giants destined to be the largest aircraft carriers in the U. S. navy, the "Yorktown" has been turned over to the navy for tests at Newport News. The two ships were authorized in 1933. The

"Yorktown" is a 20,000-ton vessel, with a flying deck 809½ feet long and 109½ feet wide, and will carry at least 140 planes and a personnel of 2,072 officers and men. Its cost was \$20,000,000.

Two-Speed Brake Unit Makes Bicycle Easier to Ride



Showing how two-speed unit works. Bottom, new and old in bicycle coaster brakes

Operated with gear shift lever like that of the automobile, a simplified two-speed coast brake unit invented by A. J. Musselman makes the bicycle easier to ride. In high gear, the unit operates like any plain coaster brake. But when the gear lever is shifted the gear ratio for pedaling is lowered twenty-eight per cent, increasing the rider's power for hill-climbing by twenty-eight per cent. In either high or low gear the coaster brake serves the usual purposes of coasting and braking. The two-speed arrangement is accomplished by replacing the worm driver of a standard Musselman coaster brake with a driver fitted with planetary gear. The shift lever is attached to the rear forks of the bicycle and has no connection with the coaster brake until the lever is pulled forward. This causes two steel fingers to contact the two-speed unit, setting in motion the reduction speed gears. The gears consist of a sun gear surrounded by three carrier

The. Musselman Sub. Brake Co.
6227 H. Clay Ave.
Cleveland Ohio

gears, with the group encircled by a driving gear. Since these gears always are in mesh, there is no danger of a stripping. In high speed the whole mechanism is locked together by three steel pins. When these pins are released, by pushing the shift lever forward, the sun gear is locked and the wheel is in low gear. By shifting the lever back the three pins, under spring pressure, return to their normal position and the wheel is in high. There is no slippage in pedaling while shifting gears.

Radio Directs Fire Fighters Speeding to Scene of Blaze

Even while they race to a distant blaze, London firemen keep in touch with headquarters by radio. Sets have been installed on the fire trucks and a radio operator is an im-



Radio operator on fire truck takes down message from headquarters while rushing to fire

portant member of the company. The two way system has proved to be especially helpful in calling for additional equipment to fight isolated fires.

Giant Swordsmen Fight Duel at Gates of Medieval Castle

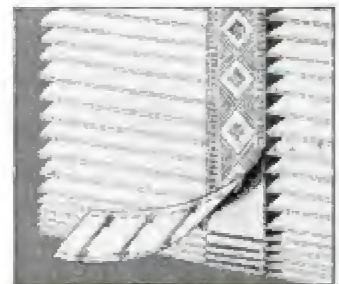


Visitors to a Long Island estate modeled after medieval castle at Seville must pass between these swordsmen. They are statues dressed in armor

Two armored knights brandish swords as if dueling at the gates of an estate at Westhampton, Long Island. The tall statues add a bit of realistic "atmosphere" at the entrance to Casa Basso, copied after a medieval castle at old Seville.

Venetian Blind Clip-On Tape Is Detached for Cleaning

Detachable for cleaning, a new clip-on facing tape for venetian blinds eliminates the eyesore of soiled tapes. The facing tape can be removed and cleaned without taking down the blind. One-eighth of an inch wider than the regular tape, the new product is equipped with clips which hook



around the regular blind tape. At top and bottom the facing tape is attached with pins or small tacks. Both cotton and silk facing tapes, made in several different designs and colors, are on the market.

E. L. Mansure Co.

605 Indiana Ave

Extra Lens Increases Depth and Speed of Camera



Note clarity in strip, left, taken with auxiliary lens, compared to strip, right, taken with ordinary lens

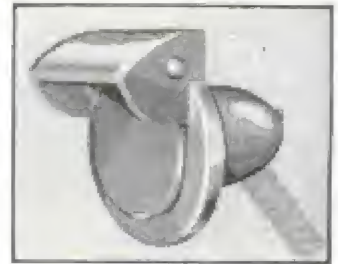
Depth of the focus and speed of the camera lens are increased through the use of an auxiliary lens now on the market. This extra lens fits squarely in front of the regular lens by means of three set screws. Ground by a new process providing continuous focus over the entire lens, instead of over about half of the surface, the lens extends one-plane sharpness of focus into all planes and produces excellent definition throughout the picture. Distortion of perspective is avoided and stereoscopic roundness and depth are added.



stat consists of one large mirror, twelve feet wide and six feet high, and other smaller mirrors. The motor turns the large mirror in accordance with the sun's position. A photoelectric cell arrangement switches on electric lamps adjacent to the mirrors when the sunlight is insufficient.

Electric "Spigot" for Outside Use Has Weatherproof Hood

Electric outlets in the garden and on the exterior of the house and garage are made possible by a weatherproof hood and hinged cover that protect the outlet. They keep out rain, snow and ice, but the flick of a finger can lift the spring-operated hood when you want to plug in.



Motor of Sander Worn on Back to Speed Boat Scraping

When a boat owner found it difficult to scrape the old paint off his boat, he hooked his sander to a secondhand quarter-horsepower motor with a flexible connection and did the job easily and quickly. The motor was fastened to a board which he strapped on his back. Electrical connections were made by cable to a lighting circuit near by.



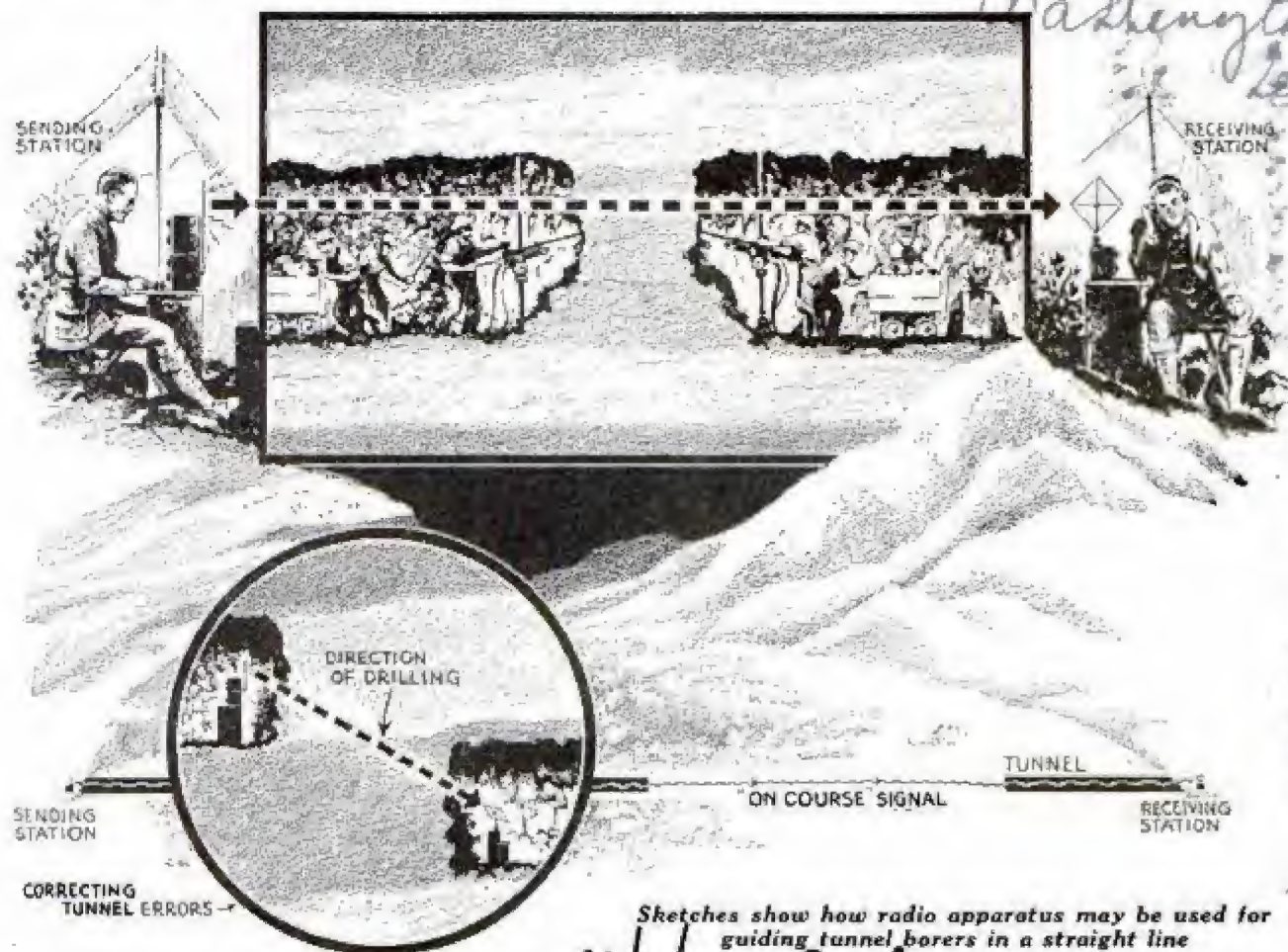
Sanding boat with aid of electric motor, strapped to back, and flexible cable

Outside Mirrors Light Room by Reflecting Sun's Rays

Normal illumination was so poor in an executive office of a London company that some other means of lighting it were sought. Finally a motor-driven heliostat, which reflected the sun's rays into the room so well that no other illumination was necessary, was installed. The helio-

Designed by Sir Howard
Kirkby Parsons and Co.

Radio Guides Tunnel Borers in Straight Line



Sketches show how radio apparatus may be used for guiding tunnel borers in a straight line

Preventing boring crews from making mistakes in tunneling through a mountain, radio direction finders are being used to keep the bore from one side on a straight line with one from the other side. The boring crews simply follow the radio beam right through the mountain. Getting tunnels to meet inside a mountain always has

been a great engineering feat. While the project may be checked from every possible angle and the utmost care employed to keep the bore straight, few tunnels have met exactly. A variation of only one inch at the start may mean that the two bores will miss each other entirely. The new method will eliminate much surveying.

Envelope "Harness" Saves Time in Feeding Typewriter

Faster work in addressing envelopes can be done with a patented paper harness which feeds the envelopes into the typewriter. The harness slips inside each envelope in the pile, and as fast as one envelope is addressed another is lifted into line ready for typing. The continuous strip passes into a basket or box as it leaves the typewriter. Finally it is drawn back over the desk and the envelope is stuffed and paper harness withdrawn in one operation.



Envelopes being fed into typewriter for addressing

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

Almer Schmidt
5357 - 44th Ave. S.

BROADCAST

Gives

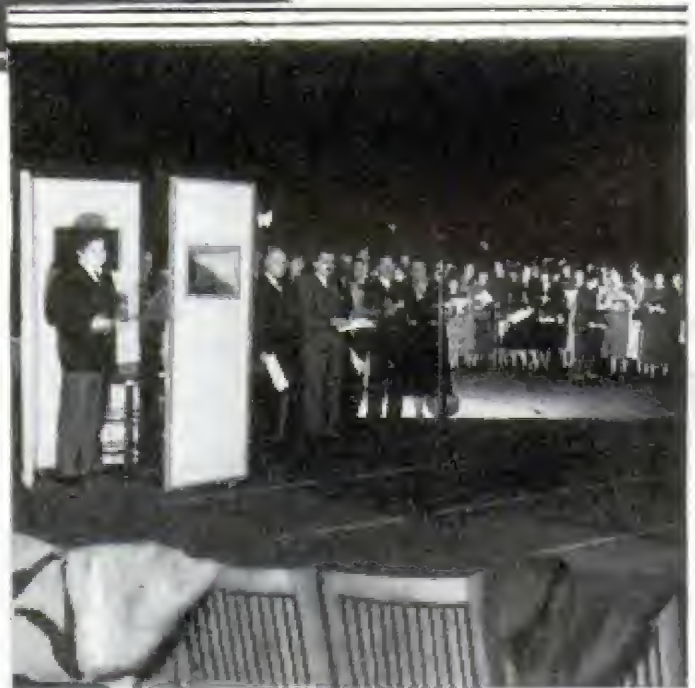
on the twenty-first floor of the Columbia Broadcasting System building in New York City, the "Columbia Workshop" goes on the air every Sunday from 7:00 to 7:30 p.m. You may find Director Reis, shirt sleeves rolled up, lowering a microphone through a hole in the top of an empty elevator, or up on the roof, directing a frozen cast while the wind and snow whistle around the microphone, or in a Broadway subway, or even in the Seventh Regiment Armory surrounded by a cast of 200 people.

If you ask the director what radio engineering has done for radio drama, he'll tell you first about scene acoustics. For the principle of scene



A YEAR ago a new kind of theater was started over the air with a radio engineer as its sole director. A young man named Irving Reis, had risen from the control panels of the "March of Time" and "Hollywood Hotel." His experimental drama venture, called the "Columbia Workshop," was dedicated to the hope that radio engineering might blaze a new trail for the radio drama of the future.

After a year's work, the "Columbia Workshop" has more than accomplished its aim. In fact, according to many of its critics, it has become the radio drama of the future itself. For it has shown that a new world of art might be made out of the materials of sound alone—that the "gadgets" of the control panel and the studio might be utilized for effects of drama never known until today. Up in Studio No. 3



Top, testing the pitch qualities of an actor's voice with the resonoscope. Bottom, cast rehearsing for "The Fall of the City" in which 200 voices were made to sound like 10,000

"SIGHT" *to the* EARS



Top, sparring prize fighters supply background for radio drama, "Fifty Grand"

Archie Leish
acoustics would be the reason he was in such a picturesque place as an elevator or a Broadway subway.

"In early radio," he tells you, "every scene, regardless of where it was laid, was played in the same studio, of the same dimensions and acoustical properties. Sound effects supplied the only change in locale and atmosphere. But today, we have learned that the human ear, without actually viewing a scene, can hear space. It can tell whether the voices it is listening to over the loudspeaker seem to be coming from the confined space of an airplane fuselage or the hard resonance of a mine

Archie Leish



shaft—merely by the amount of echo surrounding them.

"Therefore, to paint a scene in radio drama accurately, we must play it either in the actual place the script calls for, or in a place which acoustically approximates it."

For a scene in an airplane fuselage, for instance, Reis would utilize a tight, small, rather live studio; for an airplane fuselage is small, and made of metal which has an echo. For a scene in a normal room, he would use another studio, of the approximate size mentioned by the script. For a scene in a clothes closet he would place his actors inside a heavily absorbent, soundproofed booth. And for a scene in a mine shaft Reis uses an echo chamber. To make voices sound as though they were talking at the bottom of a mine shaft, he sets up a microphone in an ordinary studio. Sound from this microphone travels to the control panel in perfectly normal fashion, where it comes through one loudspeaker. At the same time, a second wire carries the same voices down to an echo chamber on another floor of the building. This echo chamber is nothing more than a long reverberating room, with a loudspeaker at one end, and a microphone at the other. The sound comes out through the loudspeaker down here, where it is bounced across the room, and picked up by the second microphone. From there it is returned to the control panel, where



It comes out over a second loudspeaker, and is mixed with the direct sound from the first loudspeaker in a ratio of twenty-five per cent direct to seventy-five per cent indirect sound.

Reis finds that the most difficult room to reproduce acoustically in radio is the courtroom. Just a little

bigger than a normal studio, a courtroom is not large enough to need the reverberating effect of the echo chamber. The answer is to have one central microphone in the ordinary studio picking up twenty-five per cent direct sound, and a second microphone on the ceiling of the same studio, twenty or thirty feet away from the voices, picking up seventy-five per cent indirect sound. Blending the two produces courtroom effects.

When Reis produced



Top, determining proper tone of frequency oscillator. Center, echo chamber for giving illusion of voices in vast space. Bottom, human heartbeat going on the air as sound effect for "The Tell-Tale Heart"

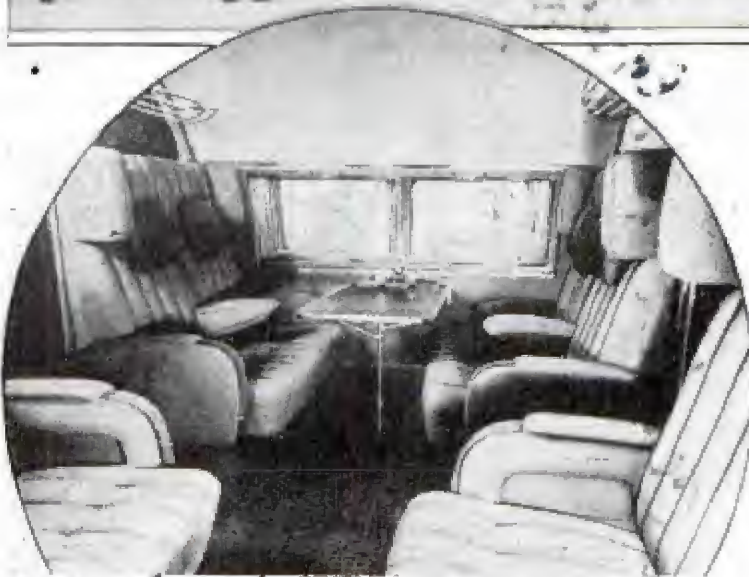
Archibald MacLeish's "The Fall of the City" this spring, he had the problem of a great scene outdoors, a scene laid in a vast city, with 10,000 people gathered on the public square, a timeless city, empty of the roar of subways or the shriek of factory whistles. Besides this, he had the problem

(Continued to page 128A)

Four-Miles-a-Minute Sky Sleeper Seats Forty

at Messau Germany

Germany's largest passenger airplane is the four-motored craft seen below and at right, just finished at Junkers' plant. One of twin tail rudders and wing flaps can be seen below. Notice roomy seats in cabin, which accommodates forty passengers. Seats are converted into berths at night



Acme

In the huge cabin of Germany's mightiest transport plane, completed recently at the Junkers' works, are five compartments accommodating forty passengers. Each compartment has four seats on either side of a central aisle, made into berths for night travel. Four motors can drive the low-winged monoplane at a top speed of 255 miles an hour. It has twin tail rudders, and its two forward landing wheels retract into the engine nacelles nearest the cabin while the plane is in flight. In the lower deck of the huge ship are located the pantry, baggage and freight rooms and lavatories.

Smoke from Chemical Gun Shows Flow of Air Currents

Heating and air-conditioning engineers have borrowed an idea from aerial skywriters. To determine the direction of air currents in a building they shoot a smoke gun loaded with the same chemicals that produce a smoke screen or write white letters against the blue sky.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.



Engineer presses bulb of chemical gun and watches drift of smoke to chart air currents in building

E. Vernon, Aeronaut and

Deaf Hear Through Fingers on Vibration Instrument



Testing apparatus which enables man seated at left to hear through his fingers

Designed as a new aid to the deaf, a vibration instrument called the multi-tactor picks up the human voice and changes it into vibrations which may be interpreted through the fingers. It transforms high-pitched tones into vibrations, hitherto regarded as impossible.

Truck Lifts Keg for Loading When Handle Is Tilted

Heavily loaded kegs, tubs and barrels can be moved about without disturbing the

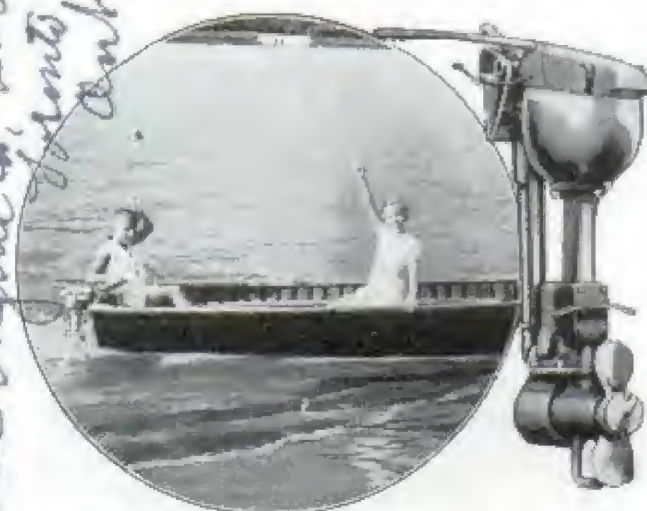


Arms close in on keg and lift it when handle of truck is tilted back, release it when tilted forward

contents by means of a hand truck with grab arms that pick up the load. The operator need not touch the container. When he tilts the truck handle back, the grab members which are curved engage the barrel and hold it firmly until tilted forward to be released.

Eleven-Pound Outboard Motor Cooled by Submersion

Weighing only eleven pounds, one of the world's lightest practical outboard motors was introduced recently. It develops one and two-tenths horsepower, sufficient to propel canoe or light rowboat. The motor is cooled by direct submersion, eliminating waterjackets, pumps, pump drive mechanism and pipes. This contributes to lightness and simplicity, in addition to preventing cracking of the cylinder if the motor is suddenly immersed in water. The fact that



Weighing only eleven pounds, this outboard motor will propel canoe or rowboat

the motor operates under water lowers its center of gravity so that it acts as a sort of keel for the boat, adding to its stability. Attachment of the propeller directly to the crankshaft eliminates all driving gears. The motor will run about eight hours on a gallon of gasoline. The oil is mixed with the fuel. With carburetor and ignition inclosed in metal, the unit is waterproof and rainproof. It can be carried easily without danger of leakage with a full tank of gasoline, ready to run, and it starts simply, the starting cord being wound on a hub at the end of the crankshaft. The motor can be started while swung out of the water on a hinge, before the boat is cast off.

Clarke Engineering Co.
9350 Sprinell

Paintings Guide Film Workers in Big Scenes

Top and left, two paintings used to guide movie makers. Right, artist working on another painting which will depict spectacular scene



© Paramount Pictures, Inc.

In an effort to bring greater artistry and realism to the screen, Hollywood's directors have adopted a technique which utilizes the talents of famous artists. Before a big film goes into production the artist paints spectacular scenes on huge canvases for use as guides by art directors, cameramen and other technical workers. Dan Sayre Groesbeck, one of the artists engaged in the work, says he is convinced that in every shot seen on the screen there should be as many square inches of dark as there are of light, and that the light should be focused in the proper places to prevent tiring the eyes of the audience. As a consequence, he prepares his paintings along that line and production experts carry out the lighting plan indicated. Caricature is essential in designing for the movies. The artist is needed to counteract the deadening and diminishing effect of the camera, by emphasizing where emphasis is required. For example, if a belt or buckle were scaled to those actually worn

by pirates, the picture would look as though the studio were trying to save on costuming, due to the diminishing effect of the camera. The artist scales certain details to counteract this effect. Although players may look overdressed on the set, that look vanishes on the screen.

Staples Removed from Paper by Teeth of Handy Tool

Removing staples from papers is made easy by a handy little tool designed for that purpose. Slipping its teeth under the staple, you press lightly with thumb and finger and the jaws close, lifting the staple out.



Ad. of a strong grip
3415 N. Ashland Ave

Scale with a Dial That Locks Permits Recheck of Weight



When needle is steady, lever is thrown and weight of parcel is "locked" for re-reading

When two persons must check the weight of a parcel, a scale with a locking dial is handy. A flip of a finger throws a lever that locks the dial in position so that the weight can be read after the package is removed. This scale is also useful in weighing parcels so large they cover the dial. The cost of mailing parcels up to fifty pounds in various postal zones is shown on the dial.

Room-Size "Lung" Aids Fight on Infantile Paralysis

Constructed as a new weapon in the nation's battle against infantile paralysis, a four-patient room which serves the same purpose as the one-patient "iron lung" is in use at a Boston hospital. Its designer, Professor Philip Drinker, predicts still larger treatment chambers. Professor Drinker, who with L. A. Shaw invented the iron lung eight years ago, points out that room-size lungs, with space for eight patients, would be easier on the patient than lying tied to one spot by the narrow metal barrel employed today. More important, it would permit the physician to enter and administer to the patient's body, in addition to making faster progress in learning how to combat the effects of the disease. The lung is used in treating paral-

ysis cases in which breathing of the patient is affected. At the Boston hospital, doctors and nurses enter the four-patient lung through a double door. They notice no sensation except a slight pressure on their ears, as the air of the room alternately becomes a vacuum and then returns to ordinary air pressure. Room-size lungs for eight patients will be cheaper in the end, Professor Drinker says, than separate iron lungs, which cost nearly \$1,000 each. The present type of iron lung induces breathing where muscles are too weak to expand the chest. The pressure changes come from blowers driven by electric motors. The pressure changes can induce breathing at any rate from ten to forty breaths a second. A scarcity of such equipment has handicapped doctors in their fight against the disease.

Small Homemade Snowplow Ends Labor with Shovel

Tired of digging through deep snowdrifts with a hand shovel, a Minneapolis householder constructed a motor-driven plow which cleans sidewalk and driveway quickly. The plow is mounted on metal runners, making it easy to push. A switch on the plow handle controls a one-sixth horsepower electric motor which drives a four-bladed fan. As the plow is pushed forward, the snow is forced up into an apron and into the whirling blades of the fan where it is cut into powder and blown out of a funnel. The funnel is reversible and will carry snow at least ten feet away.



Cleaning snow off walk. Note how plow scoops up snow and blows it out funnel

Lewis Larsen
5109-29th Ave. S.

Harvard School
Public Health
Cambridge Mass
Deser W. Borg Co
Chicago

Chicago Tribune
4/20/38

American Communications Corp.
1650 Broadway, New York

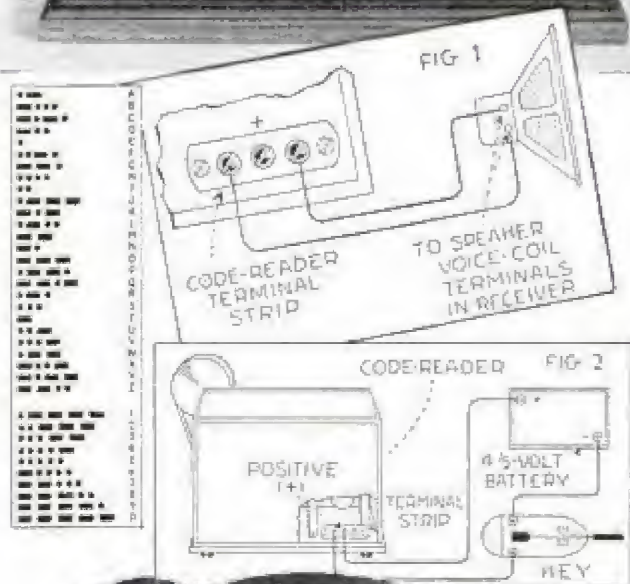
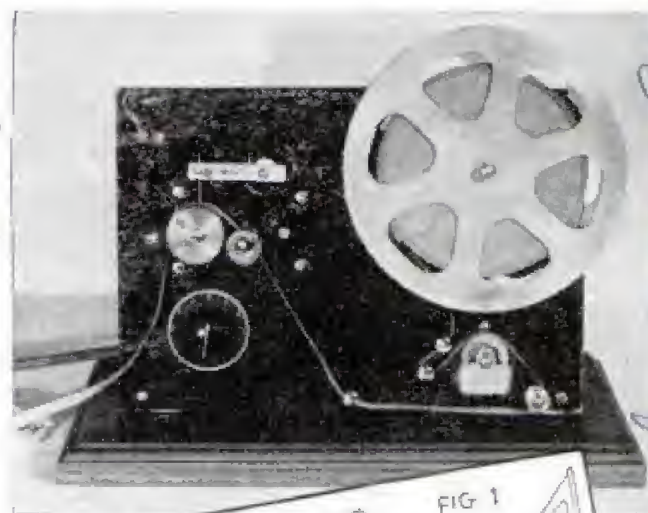


CODE *on a* TAPE

CHEMICALLY treated paper, that immediately changes color upon the application of an electric current, is employed in this inexpensive device for automatically recording a visual record of radio code received on any receiver. The actual dots and dashes may be received at high speed on the tape, after which they can be deciphered at leisure by all-wave listeners who only need to refer to the standard radio code table.

The instrument is connected directly to the voice coil leads on the loud-speaker transformer in the radio receiver as shown in Fig. 1. Signals fed into the recorder are passed through a vacuum-tube rectifier, converted into direct-current impulses, and then sent to the recording stylus through a variable potentiometer. This variable control permits the making of permanent or temporary recordings at will, by either light or dark printing.

Another application of the instrument is illustrated in Fig. 2. A standard telegraph key is connected in series with a 4½-volt dry battery and hooked to the terminal strip so that a beginner learning code can make his own tape recordings. By this method he can watch his progress in proper letter and word spacing. An additional audio oscillator enables the student to hear the practice transmissions as well as see them. Licensed amateurs can use the instrument for making permanent records to supplement the usual station log, also for checking their own transmitting skill, and that of others. As recordings are electrochemically produced there is no blotting or smudging.



Chicago Allied Radio & 33 W. Jackson

How to Build

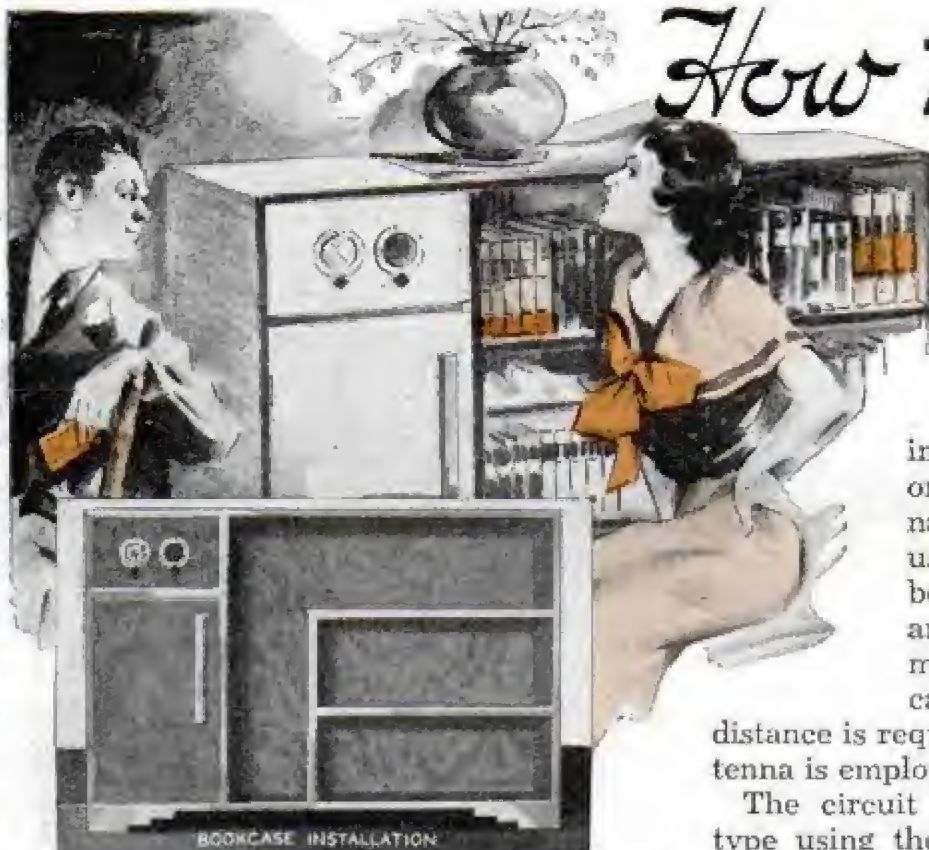
By M. N. Beitman

INEXPENSIVE and easy to build, this small up-to-date a.c.-d.c. broadcast receiver is suitable for installing in a bookcase, end table or smoking stand. No external ground connection is used and the antenna may be of the indoor variety run around behind the picture molding in the room, for local stations. Where greater

distance is required a regular outside antenna is employed.

The circuit is an improved standard type using the latest tubes and a 3-in. dynamic speaker capable of handling 2.1 watts of the output. The unusual efficiency of this compact midget set is largely due to the use of a 25L6-G beam-power amplifier tube. This tube is for the output stage of "transformerless" a.c.-d.c. receivers, especially those designed to have ample reserve of power-delivering ability. It provides high power output at the relatively low plate and screen voltages available for transformerless sets. The letter "G" indicates glass-bulb type instead of the all-metal variety.

Details for the metal base and plywood



BOOKCASE INSTALLATION

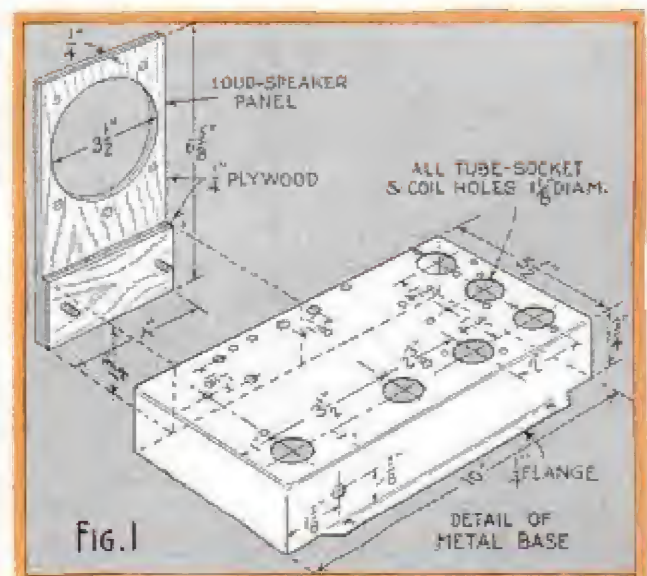
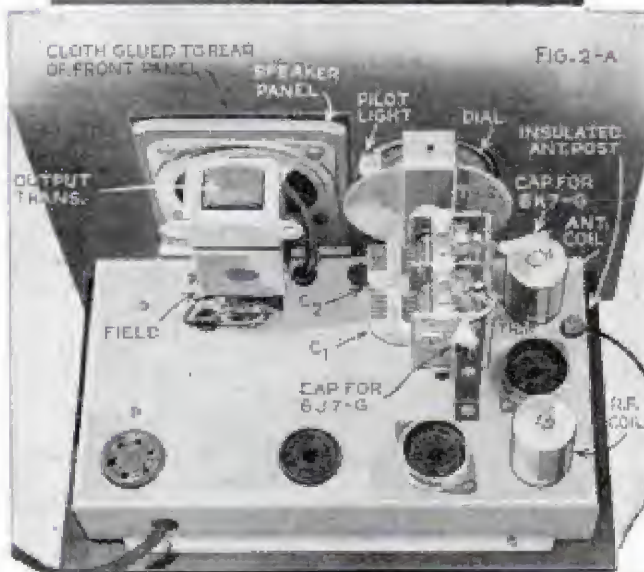
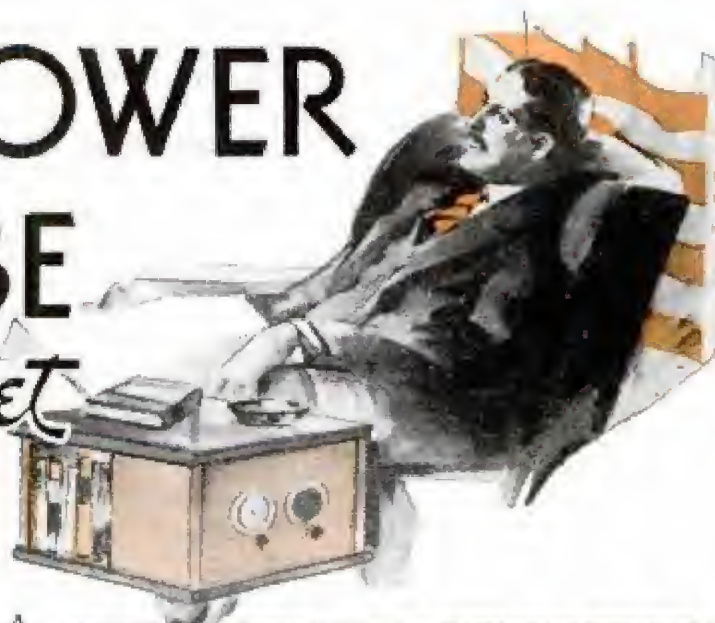


FIG. 1

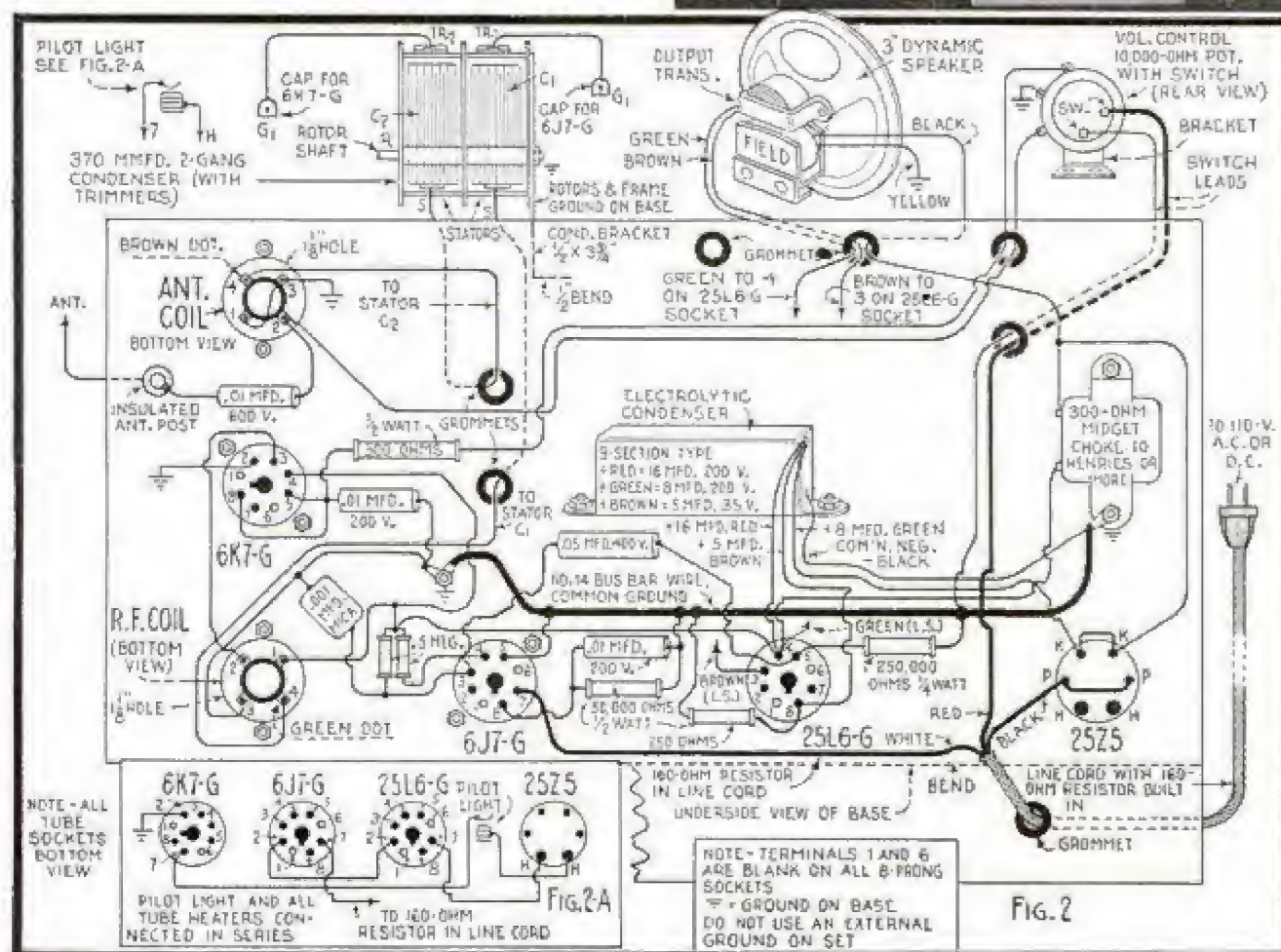
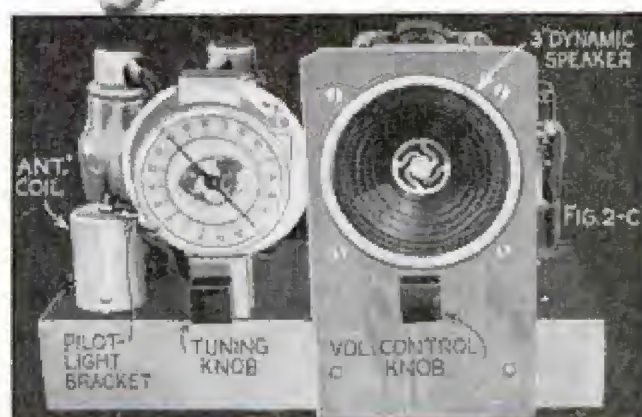
a BEAM-POWER FOUR-TUBE *Bookcase Midget*



speaker-supporting panel are given in Fig. 1; the sheet-metal base is quite simple and may be formed by bending between wood blocks clamped in a vise. A keyhole saw was used to cut the 3½-in. hole in the speaker-supporting panel; all tube-socket and coil-mounting holes in the base were first drilled with a large centering hole and then enlarged with a tapered reamer to the diameter specified.

A simplified wiring diagram appears in Fig. 2. This diagram shows an underside view of the metal base with all parts in

(Continued to page 150A)



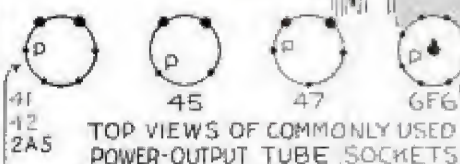
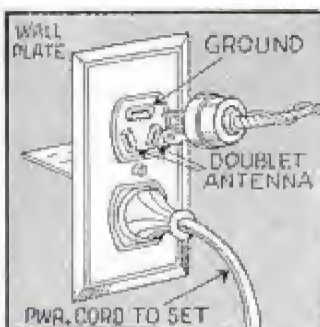
Practical RADIO SUGGESTIONS

Extra speaker added to any receiver using either single or push-pull output tubes. Refer to socket diagram for your type of output tube, locate plate prong on tube base, slip terminal lug over prong. Do not permit lug to touch set chassis, connect as shown in either Fig. 1 or 2. Switch cuts remote speaker in or out

ADDED SPEAKER

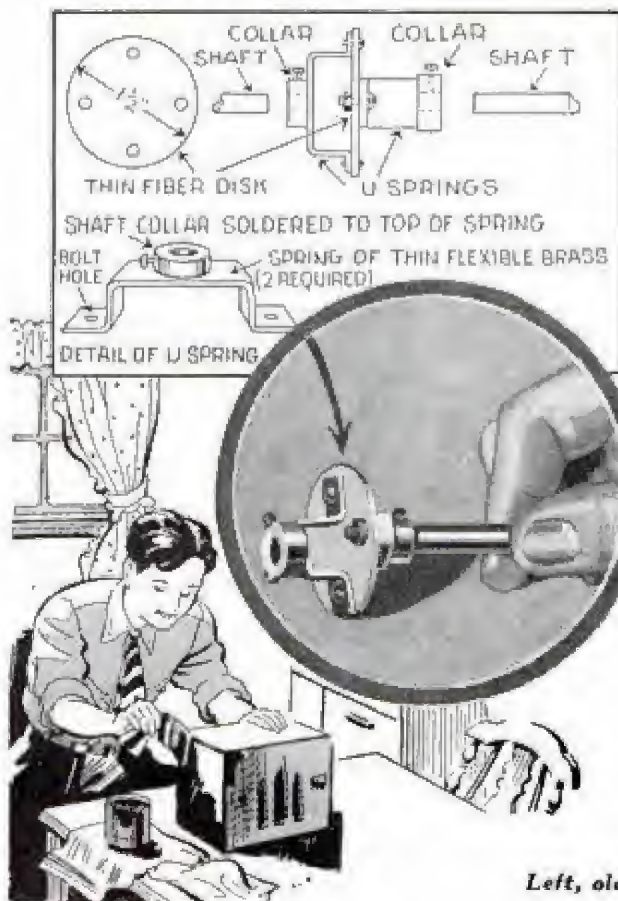
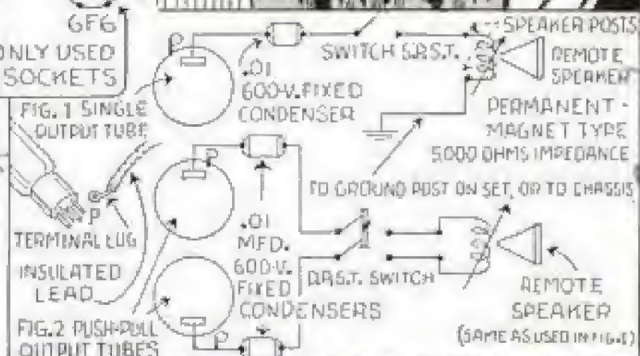
DINING ROOM

LIVING ROOM

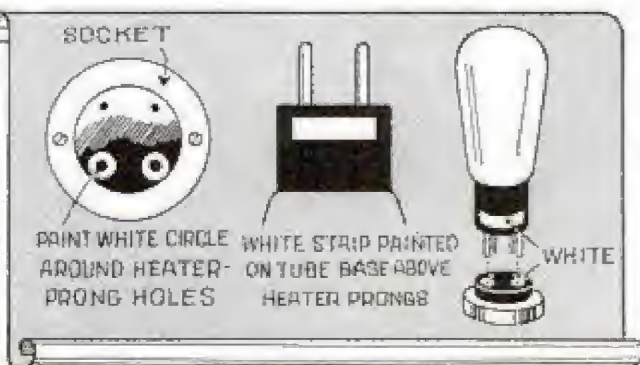


Left, wall-outlet plate provides handy doublet antenna connections, also usual power receptacle, below

Below, flexible shaft coupling made from odds and ends, for use when dial or knob does not line up with condenser or variable resistor shaft. Extension shafts are held with set screws



Above, isolantite sockets designed to grip tube prongs firmly. No metal extends through face of socket. Below, white paint provides a simple method for quickly locating the proper position for inserting tubes in dark corners of your receiver



Left, old midget cabinets can be given a coat of enamel or lacquer of shade required to fit in with room color scheme

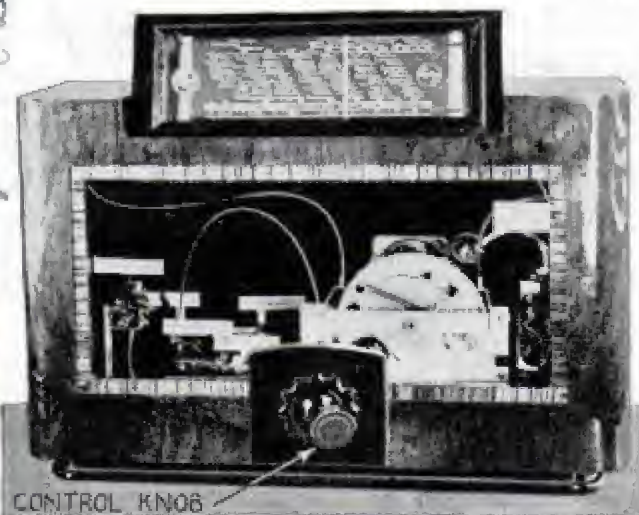
Radio Set with Phone System



A two-way communication system is an interesting feature available with a recently announced line of farm and a.c. receivers. The kit includes a remote speaker and a control box which is located at the set; push-button signaling is provided and two-way conversations are possible, the second station also acting as an extension speaker for radio programs if desired.

Shift Control on German Set

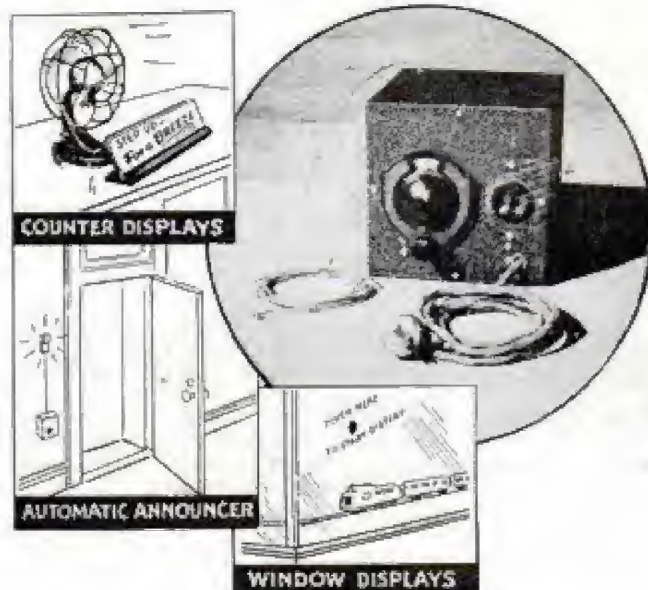
Employing the ball-joint principle, German engineers have perfected a centralized radio control for this receiver which ap-



peared at a recent radio exhibition in Berlin. By moving the control knob horizontally and vertically, the operator can adjust volume, and change from one wave band to another. Stations are tuned in by rotating the large dial knob in the usual manner. The multiple scale dial is the full-vision type listing European stations.

Capacity-Operated Relay Unit

This capacity-operated relay will close a circuit when anyone approaches the antenna, which may be a wire, metal plate, screen or other metal object. It affords a



novel means for actuating advertising displays, announcing callers by ringing a bell, protecting valuables, and generally controlling electrically operated devices without actual contact. An adjustment is provided on the front panel to permit control of the sensitivity to suit individual applications. The unit works on any 110-volt a.c. or d.c. supply line.

Blueprints covering radio construction articles in past issues are available for 25 cents each; original material lists and additional information can be obtained from our Radio Department without charge upon receipt of postage.

NEXT MONTH—How to Build a Two-Way Inter-Room Communicator. A simple a.c.-d.c. master station and from one to five remote stations, for direct two-way communication between points up to 500 feet apart. Also—**A High-Fidelity Amplifier for Home Recording and Public Address.** 2A3 tubes and 10-watt output.



Pivot-Top END TABLE

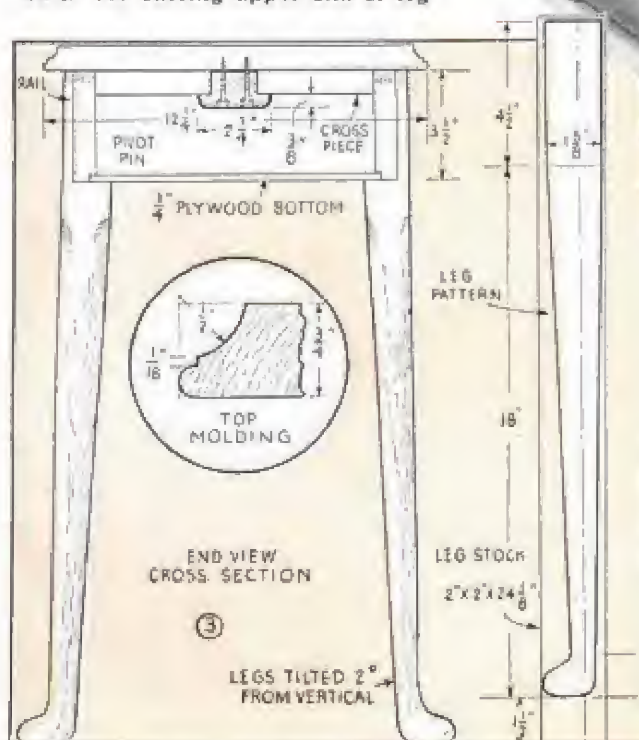
INSTEAD of having the conventional drawer, this attractive end table has a top that swings aside to reveal a spacious storage compartment. Making of the four legs comes first, and is an interesting job



The top swings aside to reveal a spacious storage compartment



Miter gauge is set and table is tilted 2° for cutting upper end of leg



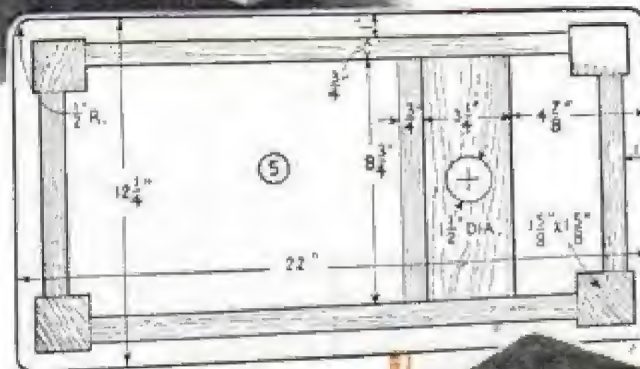
Steps in forming legs

in off-center turning on a lathe. Start by making a paper pattern of the leg shape, as shown at the right in Fig. 3. Then square up the four pieces of stock, and lay out the leg design on two adjoining sides of each piece, carrying out the centerline to the ends. Fig. 2 shows the steps in making the legs. The square end, which is not to be turned, is placed at the headstock end of the lathe. This end of the work has but one center; the tailstock end has two centers, the off center being located $\frac{1}{2}$ in. from



in position. Saw a plywood bottom to fit exactly the rabbet on the under edge of the rails, cutting away at each corner to accommodate the legs. Finally, assemble the legs to the completed top, as shown in Fig. 4, using four screws to each leg, plugging the holes. While quite simple, this makes a neat and stiff assembly, and offers no difficulties about angles such as would be encountered if the legs were fitted by tenoning or doweeling. The finish can be either bright or painted. Note, in Fig.

4, that a stop pin is provided on the underside of the top adjacent to one of the legs. This pin is necessary to stop the top square when it is swung back into position.



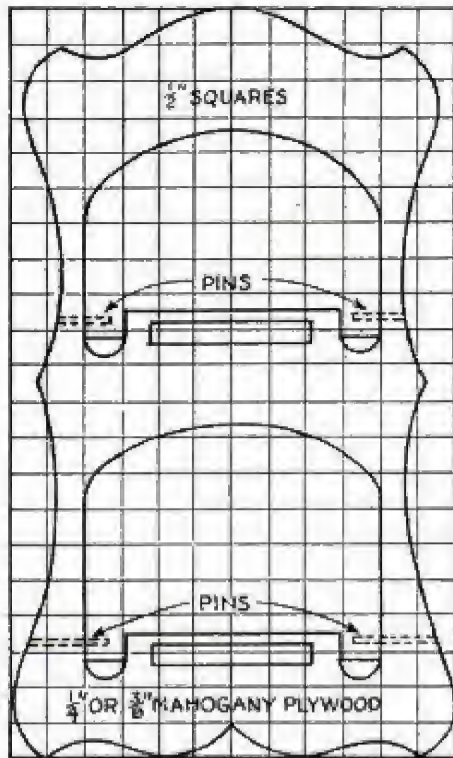
the true center on a diagonal from the latter. In turning, the work is first placed on the true centers and the complete shape is turned, including the foot. The work is then off-centered at the tailstock end and carefully turned to finish the back of the foot, after which it is filed lightly to remove the ridge lines formed by off-centering.

In the table assembly, the legs are tilted out both ways at an angle of 92° . This will not affect the bottom of the legs, which can be cut off square on a band saw, but it does affect the top ends. A compound cut on the circular saw is necessary, the table being tilted 2° and the miter gauge turned 2° , Fig. 1. The gauge is in the left-hand table groove and is turned 2° in a clockwise direction, as viewed by the operator, as indicated in Fig. 1.

Make the top and mold the edges according to the plan shown in Fig. 3. On the underside of the top, lay out the complete plan of the table, as shown in Fig. 5. Make the rails and crosspieces to the required lengths. The ends of the four rails are cut with the table level, but with the miter gauge set over 2° . Assemble the two crosspieces together and fasten them to the underside of the table by means of the pivot pin, as shown in Fig. 6. Nail the side rails to the crosspiece, and set the end rails



These Scroll-Sawed Wall Shelves Can Fold Flat



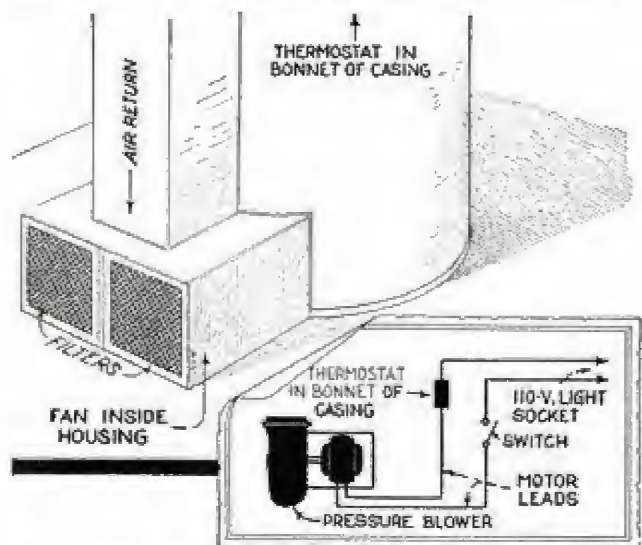
Here's something different in the construction of a bric-a-brac shelf. A piece of plywood is scroll-sawed as shown, and the cutout sections are hinged so that they can project horizontally or can be folded flush with the back. The folding feature is primarily a novelty but proves useful when the shelves are packed or stored. A short length of molding supports each shelf. As the cutout section exposes the wall behind,

The folding feature of these shelves is especially handy when storing or packing them

pleasing contrasts are possible between the objects set on the shelves and the background.—D. R. Van Horn, Lincoln, Nebr.

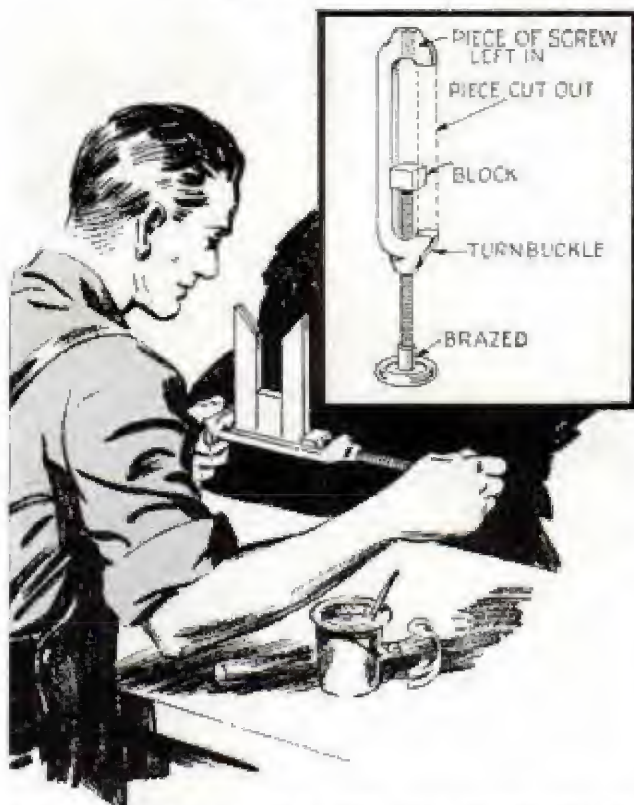
Circulating Fan in Furnace Is Operated by Thermostat

If you would like a circulating fan in the cold-air returns of a hot-air furnace, but object to the cost of operating a motor almost continuously, you can put a thermostat in the bonnet to control the fan. The thermostat can be set to stop the fan when the furnace castings reach a given temperature, letting circulation of air progress in the natural manner. When the castings cool to a certain temperature, the thermostat will start the fan, thus increasing the distribution of warm air. This arrangement permits intermittent running of the fan when it is most needed and reduces the cost of operation considerably. The wiring diagram shows how the thermostat is installed in the fan circuit.



Thermostat installed in bonnet of hot-air furnace operates circulating fan only when most needed, reducing cost of current

C-Clamps from Old Turnbuckles Have Many Uses

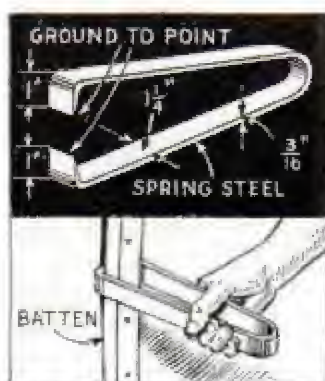


Narrow C-clamps made from turnbuckles can be used in places where regular clamps are too large

C-clamps that will serve for many odd jobs, and can be used in restricted places where it would be difficult to use regular clamps, can be made easily from discarded turnbuckles. Cut away one side of the body as shown, and file or grind square faces at each end. The right-hand threaded screw is used to clamp the work, and is fitted with a suitable grip. A small hardwood or iron block with a hole bored partly through it may be used between the end of the screw and work to prevent marring.

—W. C. Wilhite, Carlinville, Ill.

Handy Tool Removes Battens without Splitting Them



In tearing down a building on which were several battens that the workmen wished to salvage intact, the tool shown was used to do the work. It is made from a piece of $\frac{3}{16}$ -in. spring

steel bent to the shape indicated, the ends being beveled to a sharp edge. In use, the wedge-shaped ends are forced behind the batten, after which the tool is used as a pry to loosen it.

Camera View Finder Illuminates Iris on Photo Enlarger

Illumination for the iris adjustment on the lens of an enlarger can be arranged by mounting a camera view finder above the lens, as indicated in the photo. Remove the view finder from any small hand camera and mount it by drilling a hole through the board



near the lens. Scattered light from inside the enlarger will pass through the view finder and will be reflected directly onto the iris ring.

—Weldon H. Whisler, Davenport, Iowa.

Make Your Own Luminous Paint

Luminous paints may be made by mixing varnish, precipitated barium sulphate and dry color with luminous calcium sulphide. When you purchase the latter chemical be sure it is labeled "luminous" as the chemically pure and the ordinary commercial calcium sulphides are useless for this purpose. To prepare a luminous paint that emits a blue light, grind together in a mortar, barium sulphate, $1\frac{1}{4}$ oz., ultramarine blue, $\frac{3}{4}$ oz., cobalt blue, $\frac{1}{2}$ oz., and luminous calcium sulphide, $5\frac{3}{4}$ oz. These chemicals should be ground finely. To the mixed powders add varnish, $5\frac{1}{4}$ oz., and continue the grinding until the whole is perfectly mixed. The quality of the paint produced depends on how well the grinding and mixing are done. The finished paint may be applied in the same manner as any other paint. After an object covered with this preparation has been exposed to light, it will continue to glow when placed in a dark room. The brilliance and length of time it will glow depend on

the length of exposure and intensity of light. Luminous paints may be made to emit other colors by mixing the following ingredients in the same way. Green luminous paint consists of barium sulphate, $1\frac{1}{4}$ oz., chrome green, 1 oz., luminous calcium sulphide, $4\frac{1}{2}$ oz. and varnish, 6 oz. A yellow paint can be made by substituting chrome yellow for the chrome green in the last formula. An orange paint is made from barium sulphate, $2\frac{1}{4}$ oz., Indian yellow, $1\frac{1}{4}$ oz., madder lake, $1\frac{1}{2}$ oz., luminous calcium sulphide, $4\frac{3}{4}$ oz. and varnish, $5\frac{3}{4}$ oz. A brilliant red may be had by mixing barium sulphate, 1 oz., madder lake, $1\frac{1}{2}$ oz., luminous calcium sulphide, 4 oz. and varnish, $5\frac{1}{2}$ oz. By experimenting with other dry colors and varying the proportions to suit, it is possible to produce still other colors.

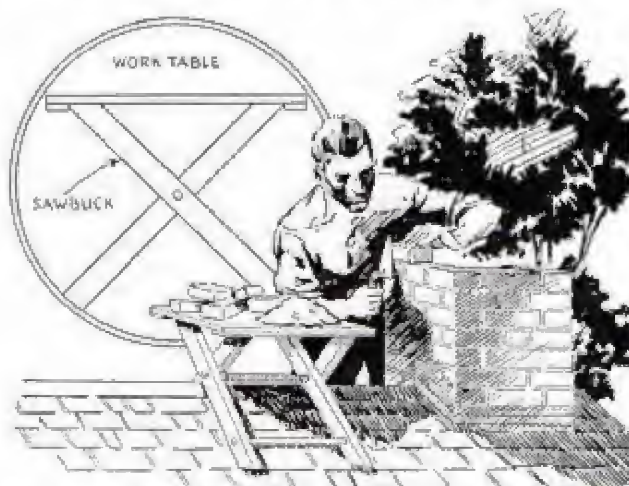
Ringer Game Played on Table Is Enjoyed by Everyone



Here's a game that affords lots of fun for long winter evenings and one that can be played right on your dining table

This Worktable Straddles Roof While Repairing Chimney

To provide a worktable for holding bricks and mortar, and to eliminate the usual trouble of building one on the roof each time, one workman carries a light, folding sawbuck and a table top with cleats



The workman carries this worktable from job to job, and it is ready for instant use by unfolding it

across the underside. In use, the buck is opened to straddle the ridge of the roof and the top is placed so that the cleats keep the buck from spreading.

—G. E. Hendrickson, Argyle, Wis.

Played similar to a miniature horseshoe game, this ringer game is enjoyed by everyone and will provide entertainment for long winter evenings. The ringers are made from heavy cardboard, as indicated in the lower detail, and the two stands are made by driving nails into wood disks, the nails projecting about 2 in. The game is played on a table and the score is counted as follows: The three outer openings of the ringer count five points each. The next three openings count ten points and the center opening counts twenty-five.

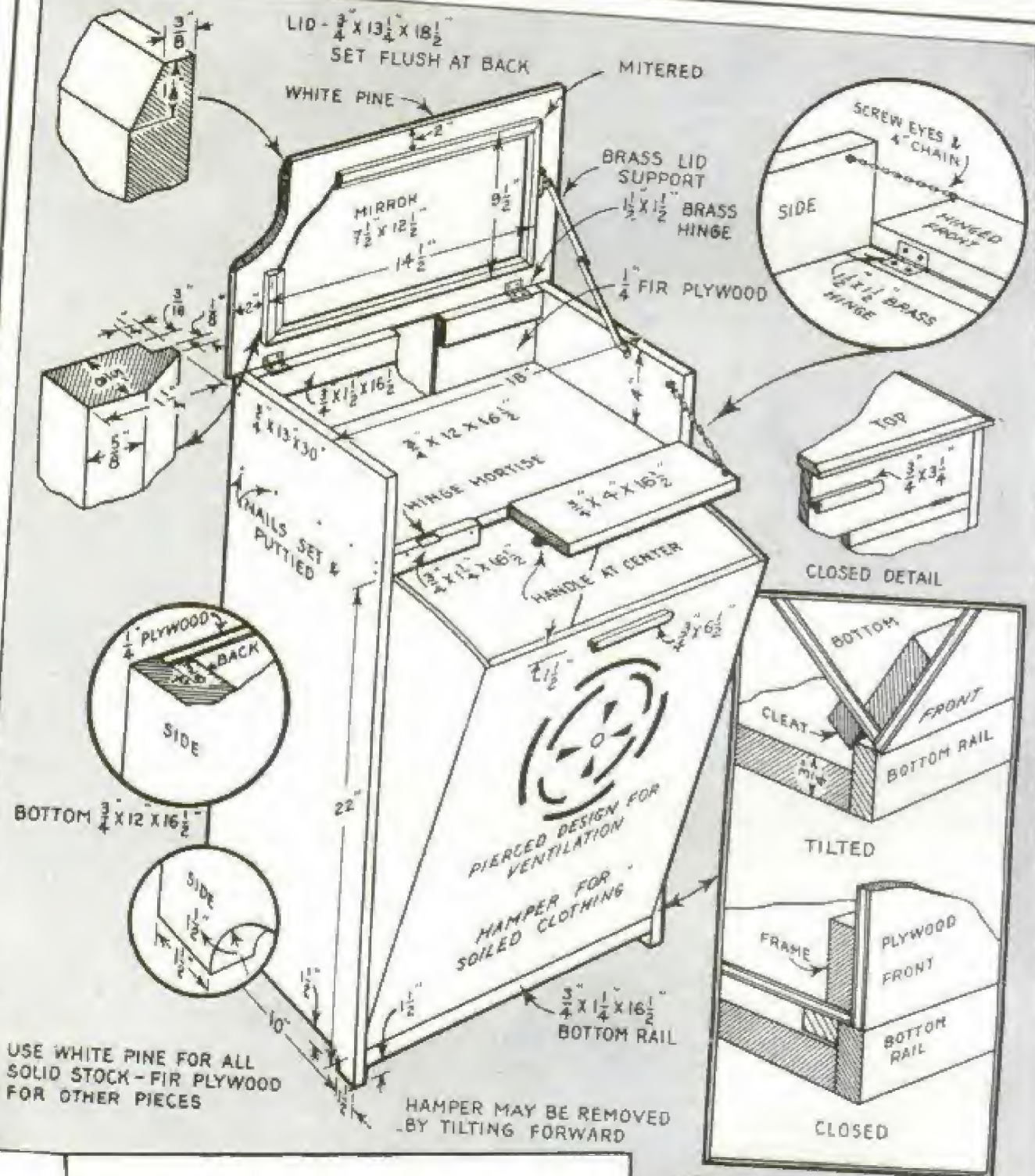
—Elmer A. Kellerman, Milwaukee, Wis.

Yarn-Ball Holder on Knitting Bag

Women who are in the habit of knitting in a car or on a train will find that a cloth or leather pocket sewed onto one side of their knitting bag is handy for carrying a yarn ball. In use, the flap of the pocket is opened and the yarn pulled out as needed, the ball remaining in the pocket at all times.



HAMPER *combined*

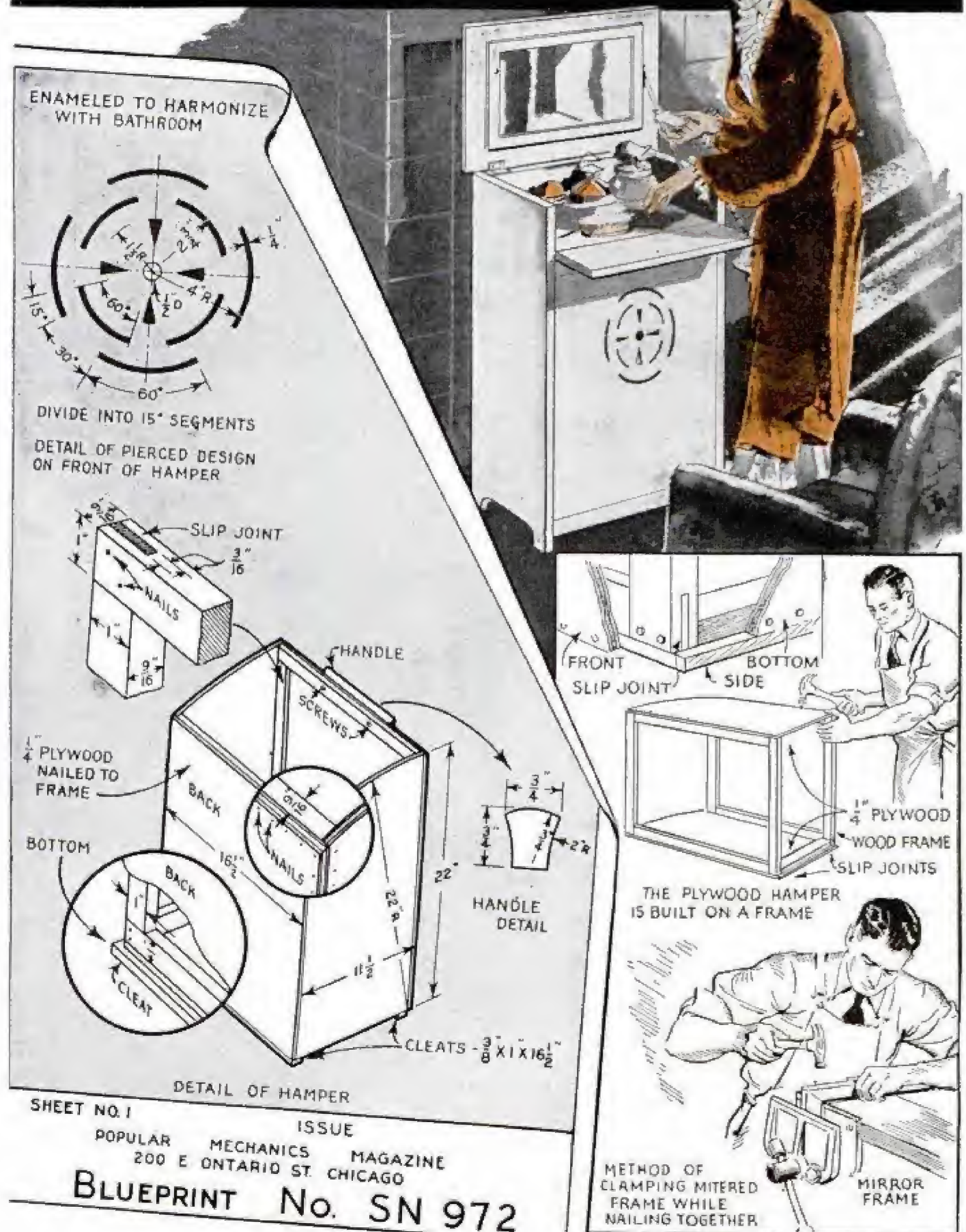


SCALE
DESIGN
DRAWN

Requiring only the floor space of a hamper, this combination unit is ideal for a small bathroom where all space must be utilized. The lid swings up exposing a mirror and space where cosmetic articles are kept. It's an easy matter to remove the clothes hamper by merely tipping it forward and lifting it out.

**POPULAR
MECHANICS**
MAGAZINE

with VANITY



Scale on Sewing-Machine Cabinet Saves Time for Seamstress

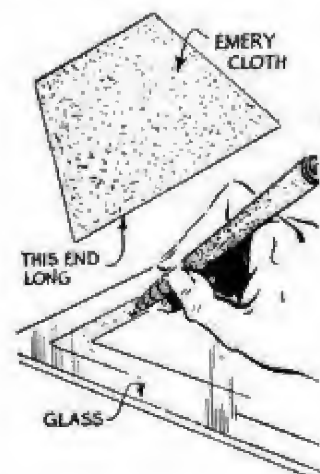


Scale along edge of sewing-machine cabinet is always at hand for quickly taking measurements

Cemented along the front and left-hand end of a sewing machine, a tape measure provides a handy means of measuring cloth quickly. If you object to a tape measure applied on the wood, the scale can be scribed in the wood. Or, if you want a real good job, the edge of the cabinet can be rabbeted and a hardwood scale inlaid.

Making Abrasive "Pencils"

Modelmakers, die sinkers, experimenters and home workshop owners will find many uses for abrasive pencils, which can

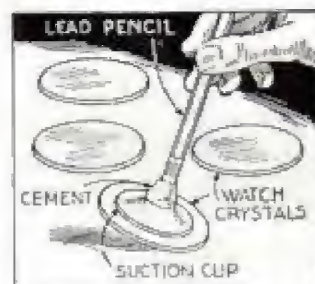


be made from pieces of emery cloth or sandpaper. The abrasive material is cut to a diagonal shape and then rolled tightly to form a pencil with a tapered end, as indicated. Such pencils are handy for smoothing up rough edges of glass, scratching initials, monograms, etc., on metal, smoothing up scroll work, and dozens of similar jobs. They are also an aid in smoothing out rough places

in dies or on small machines and for cleaning and polishing all sorts of cavities in either wood or metal. Modelmakers will find them especially valuable for getting into cramped places where they cannot use abrasive paper strips or squares.

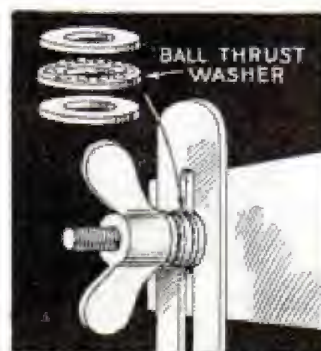
Watch Crystals Handled Easily with Small Vacuum Cup

Jewelers and others who have to handle watch crystals will find that a small vacuum cup fitted with a handle, such as a lead pencil,



picking them up from flat surfaces. This lifter is especially handy when picking up several different crystals and trying them in the watch to find one that will fit.

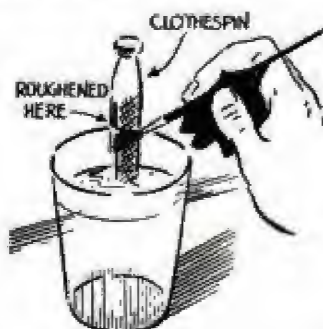
Ball Thrust Washer on Wing Nut Makes It Easy to Adjust



When a wing nut is used in a place where it must be adjusted frequently, a ball thrust washer behind it will make it easy to loosen or tighten. Small thrust washers of this type usually can be picked up at any junk yard inexpensively.—A. H. Waychoff, Tempe, Ariz.

Cleaning Small Brushes

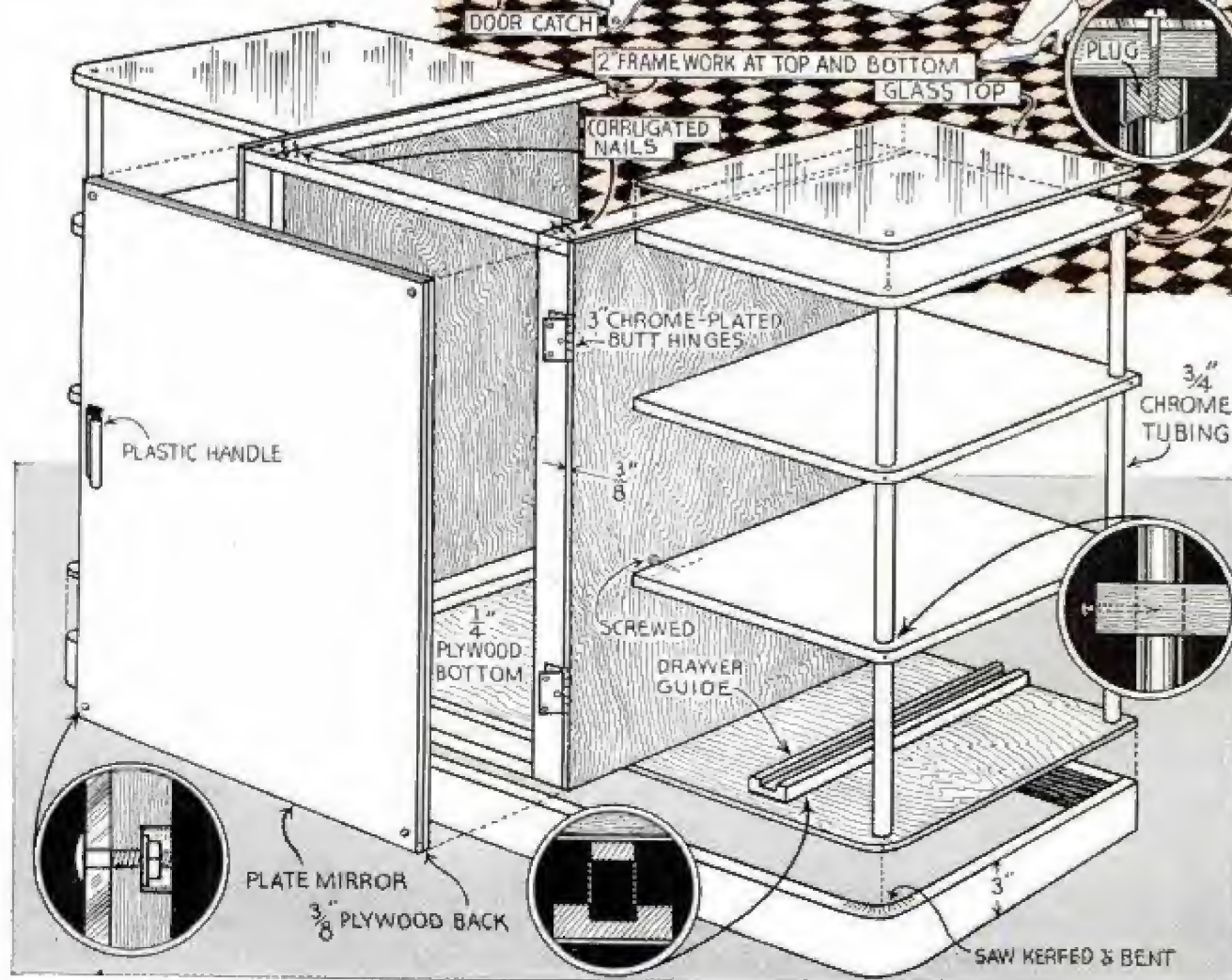
Artists will find that they can clean a brush quickly on the roughened surface of a clothespin, which is slipped over the edge of a tumbler. One leg of the pin is roughened with a coarse wood rasp and is submerged in the water.—Opie Read, Jr., Chicago.



Modern LINEN CHEST

encloses wash stand

This cabinet makes good use of the space under the bathroom lavatory for convenient storage of towels, wash cloths, etc. A mirrored door swings out from the center compartment, which serves a two-fold purpose—that of concealing the plumbing and receiving the soiled linens. Fitting the cabinet to the lavatory must be done in successive steps to assure a neat job. The whole thing sets on a base of $\frac{3}{4}$ by 3-in. stock, saw-kerfed and bent at the outer corners as shown. The frame is covered with $\frac{3}{8}$ -in. plywood, fastened in place with small screws. To assure close fit with the lavatory, build the base first, then the frame of the center compartment and finally fit the plywood sides and end shelves. Drawers, mirror, and the glass on the top shelves are optional. The wood is finished with several coats of enamel to match the lavatory



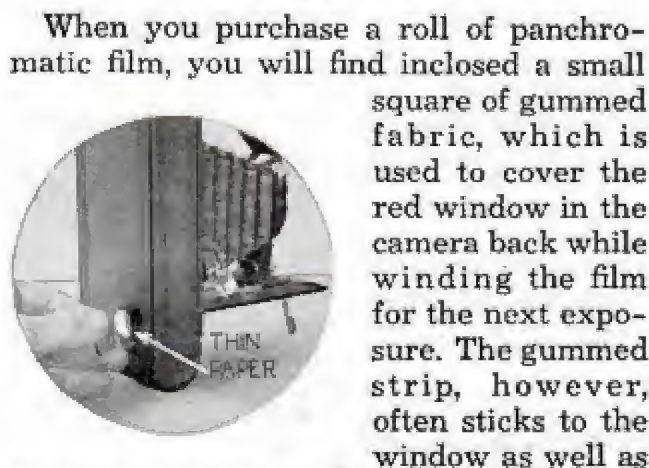
Sandblasting with Scratch Brush on Tool Grinder



Any home mechanic who has a grinder and wire scratch brush can do a good job of sandblasting

If a regular sandblasting outfit is not available but you do have access to a motor-driven grinder, sandblasting can be done by dropping sand on a rotating wire scratch brush, which throws the sand against the work with considerable force. A flat-iron bracket carrying a celluloid eye shield and a funnel to direct the sand onto the brush is screwed to one of the grinder-wheel shields, and the work is set on a box or other support in front of the brush. Adjusting of both the work and the funnel will enable you to make the sand hit the work where desired.

Window in Camera Protected by Paper Disk



When you purchase a roll of panchromatic film, you will find inclosed a small square of gummed fabric, which is used to cover the red window in the camera back while winding the film for the next exposure. The gummed strip, however, often sticks to the window as well as

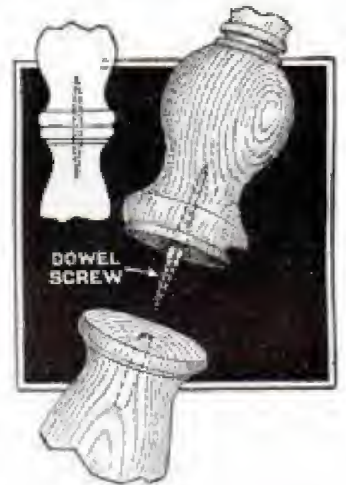
to the camera case, and the act of pulling it away causes the red insert to loosen and pull out of place. After nearly losing the

insert in my camera, I attached a small disk of thin paper to the inside of the gummed fabric so that when the strip is pressed over the window, the insert is protected from contact with the adhesive.

—W. C. Wilhite, Carlinville, Ill.

Wood Turnings Neatly Joined with Dowel Screws

Instead of using ordinary wood dowels in joining wood turnings, I use dowel screws, which not only make the use of clamps unnecessary, but provide a joint that is tight and invisible even at close scrutiny. The joints are made by drilling pilot holes in the ends of the turnings to take the screws.

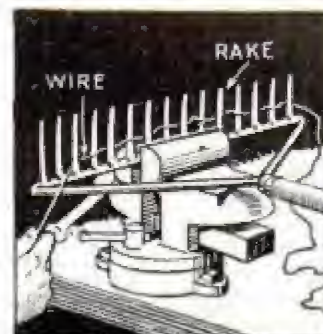


The screw is driven into one hole with a small pipe wrench, after which the other turning is screwed onto the projecting end.

—Clyde Utz, Bangor, Pa.

Kinked Wire Is Straightened in Garden Hose

Clamped in a vise with the teeth projecting upward, an ordinary garden rake makes a good tool to take the kinks out of a length of iron or copper wire of small or

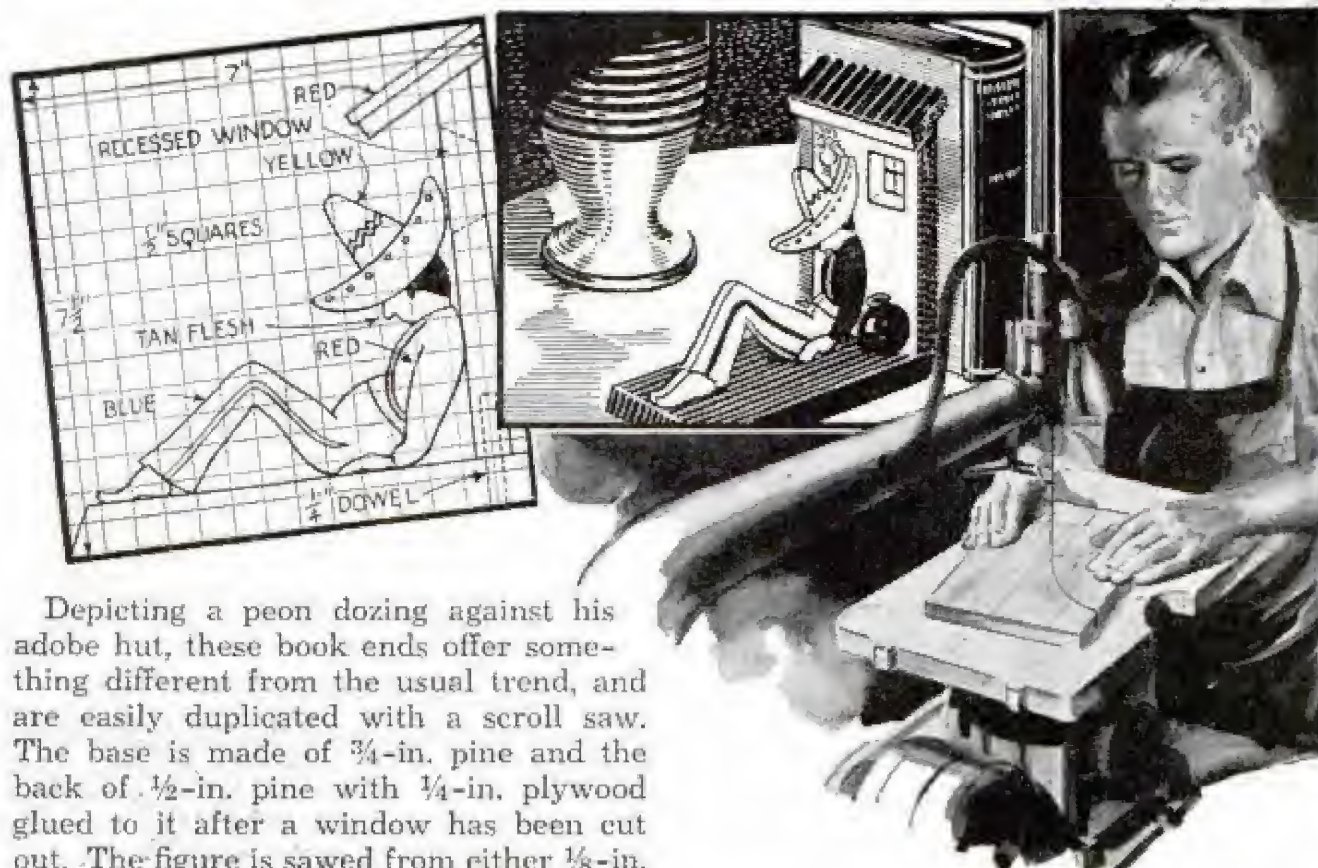


medium size. The handle of the rake is blocked up so that the head and ferrule are not strained. The wire is woven between a number of the teeth, depending on the size and the resistance needed

to straighten it. A pair of pliers is used to pull the wire through the teeth.

Ordinary paper plates about 10 in. in diameter make excellent bases for bird cages and save cutting paper or buying gravelled paper for the purpose.

'Lazy-Peon' Book Ends Made in One Evening



Depicting a peon dozing against his adobe hut, these book ends offer something different from the usual trend, and are easily duplicated with a scroll saw. The base is made of $\frac{3}{4}$ -in. pine and the back of $\frac{1}{2}$ -in. pine with $\frac{1}{4}$ -in. plywood glued to it after a window has been cut out. The figure is sawed from either $\frac{1}{8}$ -in. plywood or hard-pressed board. Sheet rubber is glued to the underside to provide friction against the table top to keep the book ends from spreading. A realistic

painting job is necessary to get the full effect, and bright colors should rule. Brads and casein glue are used in assembling.

How to Figure Operating Cost of Electrical Appliances

Have you ever wondered what it cost to operate certain electrical appliances, especially those that did not have the current rating stamped on the nameplate? To find

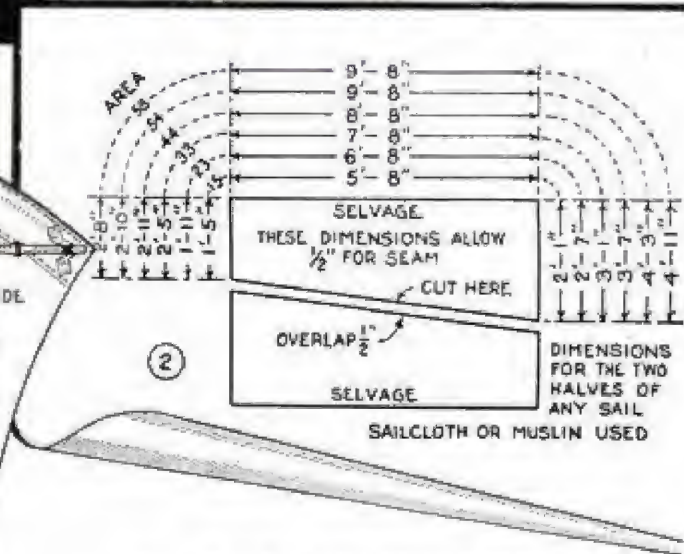
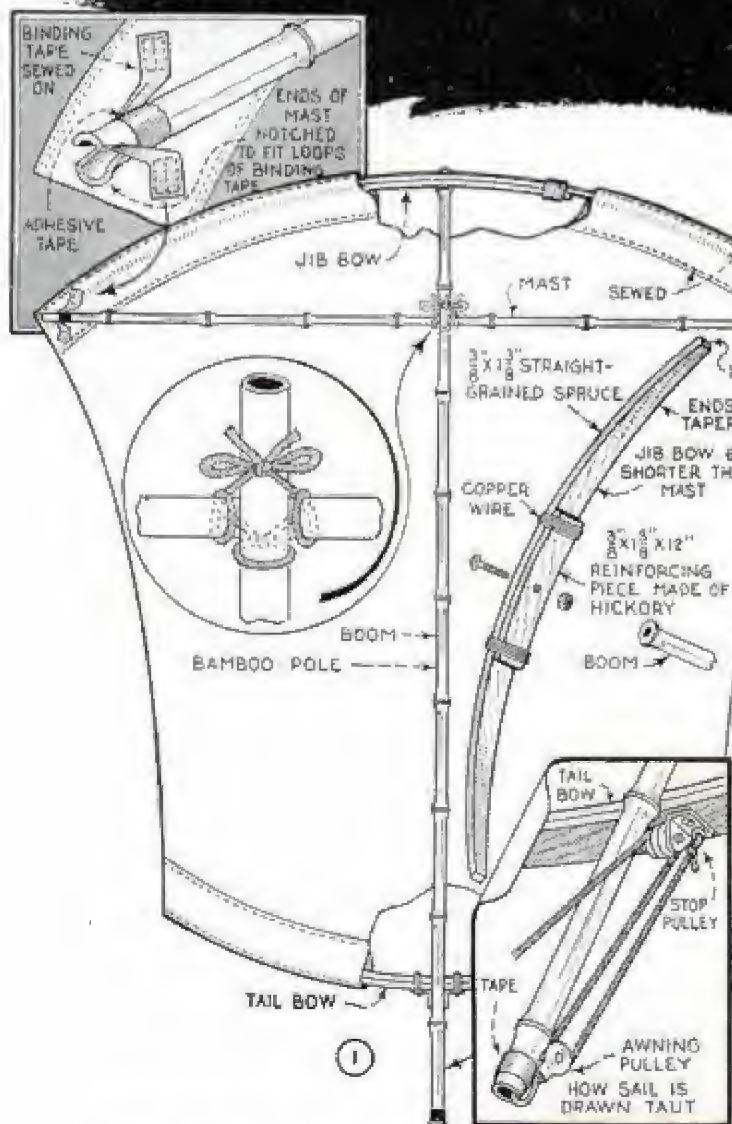


It's easy to figure current consumption of electrical appliance that does not have wattage on nameplate

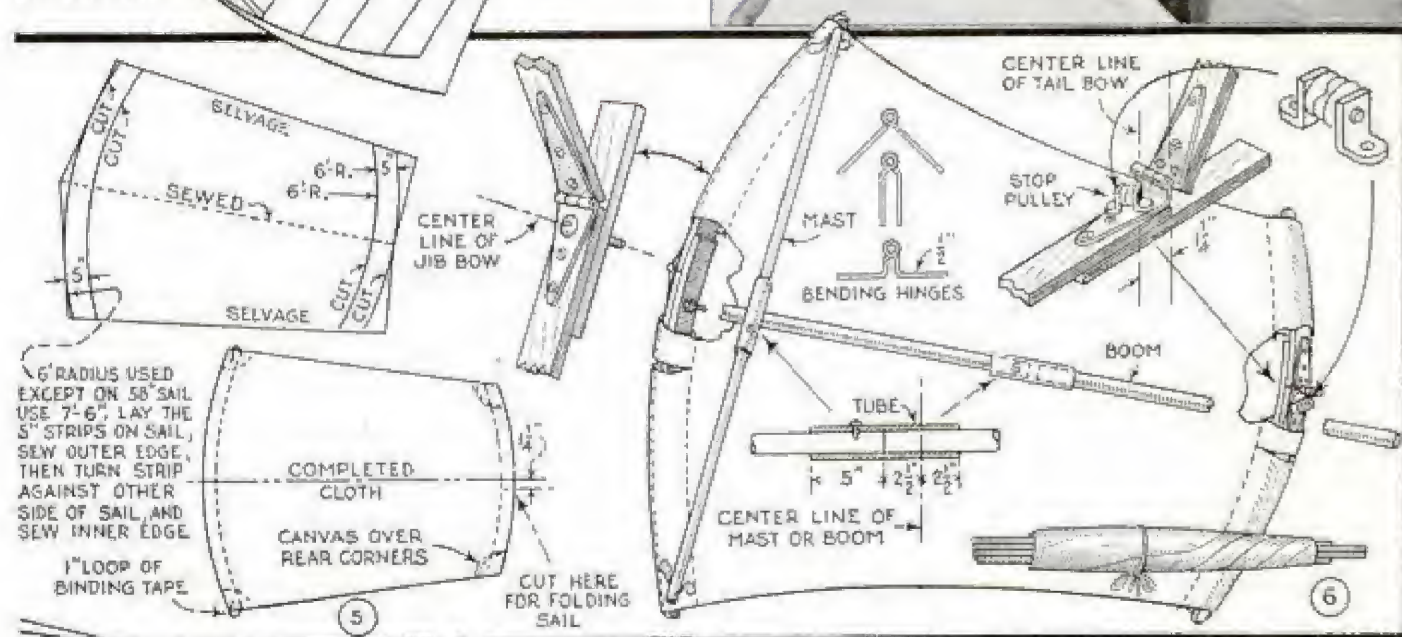
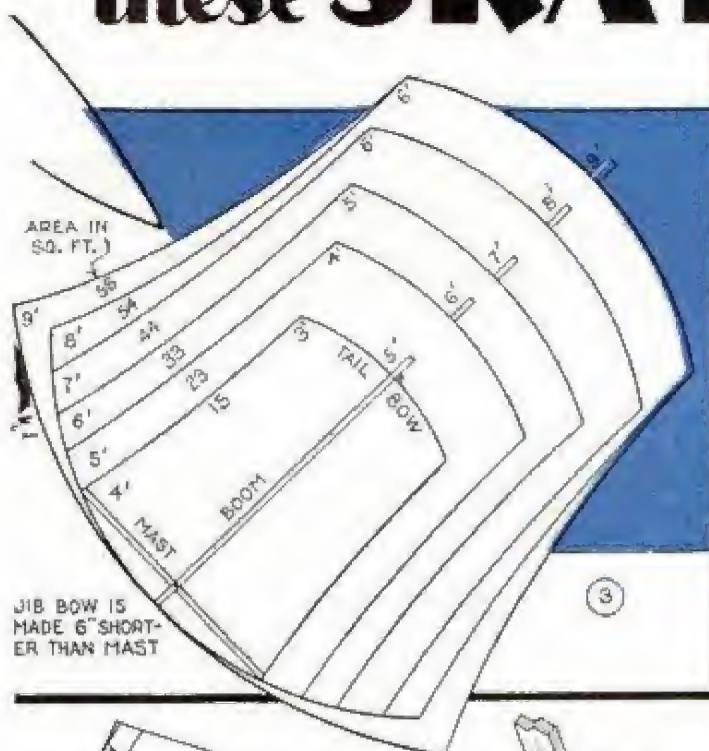
out easily turn off all appliances and turn on a few lamps of known wattage. Then count the number of revolutions that the disk in your electric meter makes in two minutes. Now turn off the lights and turn on the appliance for the same length of time and count the revolutions of the meter disk. For example, say the wattage of the lamps was 700 and the disk made 70 revolutions in 2 min., and for the appliance, it made 15 revolutions. Multiply 700 by 15 and divide by 70, which gives you 150, the wattage of the appliance. Next, multiply this by the number of hours that the appliance operates per month, which gives watts consumed. Dividing this by 1,000 gives the kilowatts. Multiply this figure by the rate charged per kilowatt by your electric company.

☞ A soft cloth wound around a stick is handy for dusting under low furniture.

Go like the wind!



with these SKATE SAILS



at the sport. Practiced skaters can handle the larger sails close to the wind with possibly a noticeable increase in speed and greater latitude of direction, but the more common practice is tacking across the wind. Although this imposes certain limitations, it is perhaps all in all the safest and best, particularly if you are on an unfamiliar stretch of ice. Cross-wind sailing gives you definite control, for by simply coming up into the wind you can stop easily. And, when headed into the wind, one can reverse his direction by grasping the mast with both hands, one on each side of

the boom, then duck, roll the sail over the shoulders to the other side and swing across the wind for the second tack.

Materials for building skate sails are easy to get most anywhere. Sailcloth can be used, but the best unbleached muslin will serve the purpose. For a simple sail rig that can be taken down, bamboo poles which are used to roll rugs on will be just the thing for the mast and boom, but for a folding sail straight-grained spruce should be used for these parts and the bows, Fig. 1. As a substitute for spruce you can use $\frac{3}{8}$ by $1\frac{3}{8}$ -in. straight-grained yellow pine



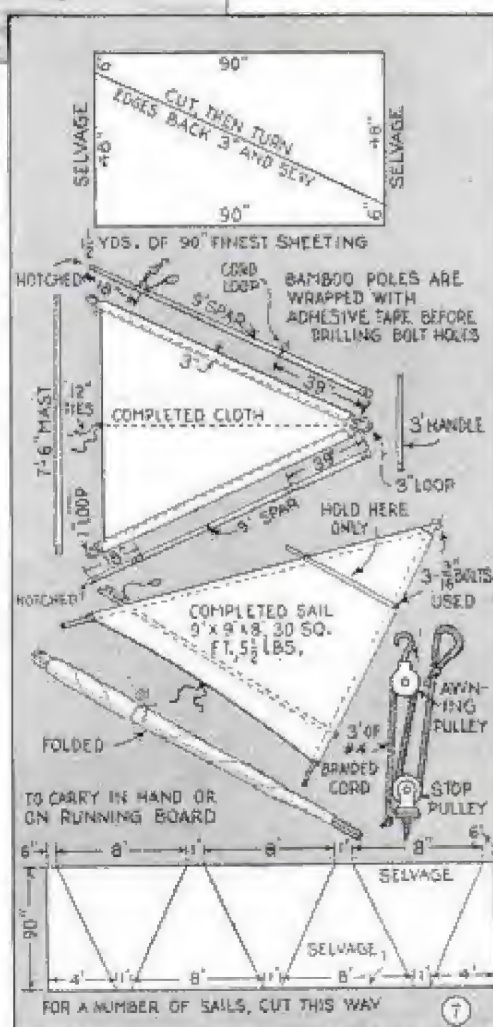
for the bow pieces. Fig. 2 gives dimensions for cutting the various sail sizes from the cloth. Fig. 3 gives the over-all dimensions and areas, and Fig. 5 shows how the sail is cut. Now, going back to Fig. 1, notice how the bows are reinforced with a hardwood strip at the center and also that they fit in pockets in the ends of the sail. A stove bolt, passing through the jib bow, is inserted in a hole in the end of the boom when the rig is set up.

Inexpensive, double-purchase, self-locking tackle for stretching the sail is shown in Figs. 1 and 4. The "stop" or locking pulley is of the type often used on large shades in store windows. To lock the cord when the desired tension has been applied, you simply feed it into one side of the pulley. The stop pulley, as you see, is screwed to the tail bow while the other is hooked into the open end of the boom. Fig. 6 shows what is necessary if you want the sail and rig to fold into a smaller bundle. Brass hinges and sleeves add some weight, of course. Bow pockets at the ends of the sail are cut through as shown and the bows are hinged

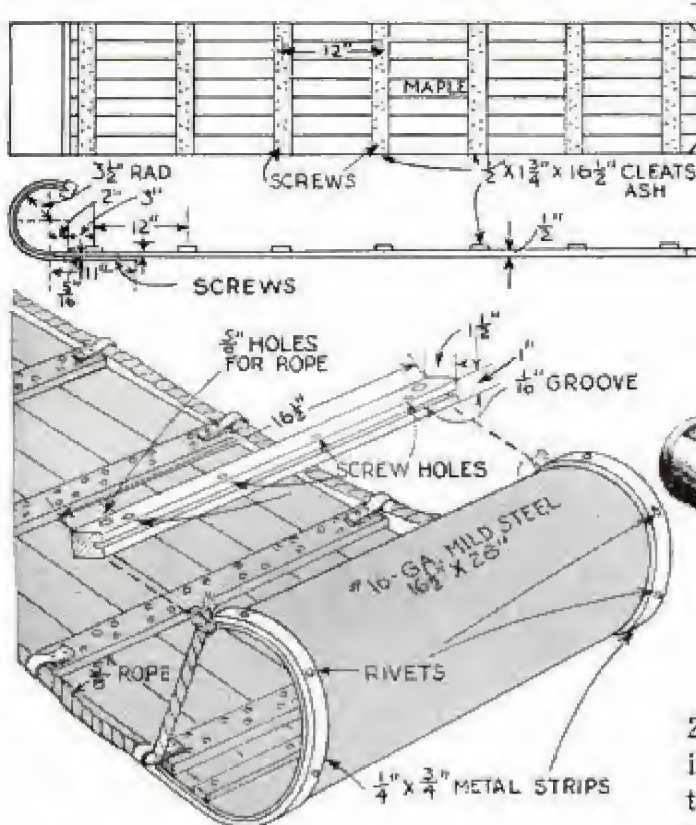
so that they will fold. The boom and mast are in two pieces held at the center with sleeves made of brass tubing. With these fittings the whole rig can be collapsed and then folded into a compact bundle for convenient carrying.

Fig. 7 gives the constructional details for the triangular sail and rig, a type still preferred by many skaters. Here the rig consists of two spars, a mast and handle. All these parts can be made of bamboo or light, straight-grained wood. The tackle for stretching the sail is essentially the same as that previously described. The size of the sail given in Fig. 7 is a good average size. One of the details suggests an economical method of cutting a number of these sails from a single piece of cloth.

This sail, when fully rigged, will average only about 5½ lbs. in weight and will suit a skater of most any height. Although its performance hardly equals that of the sail and rig described in the beginning, it holds plenty of thrills for the skater skillful enough to handle it in a strong breeze. The procedure in getting away and in tacking across the wind is much the same as that used with the other type of sail and rig.



Steel Front Simplifies Building a Toboggan



Simplicity in the construction of a toboggan is the object of this rolled-steel front as it eliminates steaming and bending of wood. Strips of straight-grained maple, 1/2 in. thick, are held together by white-ash cleats with glue and screws. The outside and center strips, which are

2 1/2 in. wide, are tapered from 1/2 to 5/16 in. in thickness, starting 27 in. from the front, to provide runners. In making the front, you first bend the steel reinforcing pieces to the desired radius. They must be identical in shape and the metal front must also be the same curvature, except the 11-in. straight portion that is screwed to the wood part. The metal should be enameled in an attractive color.

—Ambrose B. Charette, Milwaukee, Wis.

Coping-Saw Frame Shielded to Prevent Marring Work

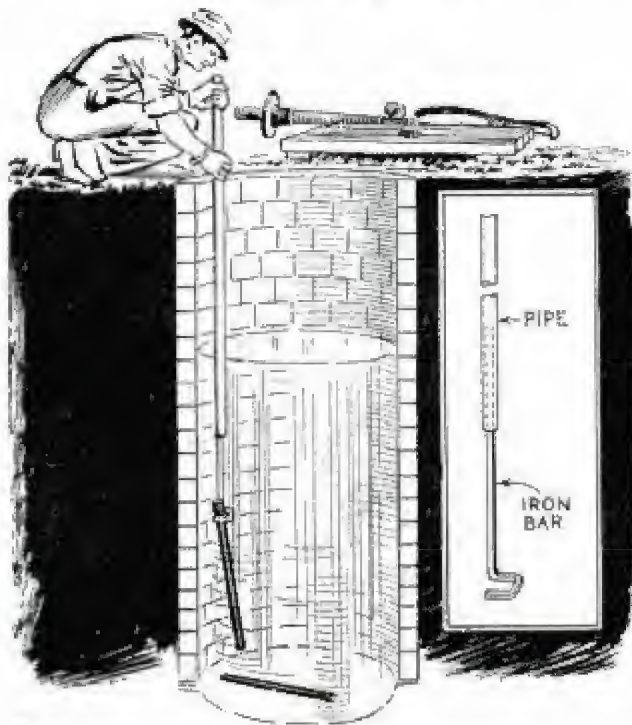
To avoid accidentally marring work with the ends of a hand coping saw, by taking too long strokes, one workman provides a sponge-rubber ball at one or both ends of the saw as indicated. The balls, about 1 in. in diameter, are slit through the center and slipped over the blade.

Clothing Made Fire Resistant

Anyone who works where there is possibility of clothes catching fire, can make them resistant to fire by the following treatment: First dip the clothing in a solution made by dissolving sodium stannate, 3 lbs., in water, 1 gal. Wring dry and dip them in a solution consisting of ammonium sulphate, 1/4 lb., and water, 1 gal. After the last dipping, wring them dry again.



'Fishing' Pipe from Shallow Well with Iron Hook

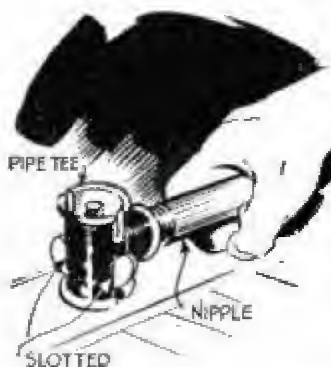


The usual difficult job of "fishing" a piece of pipe from a well is done in a jiffy with this tool

When a piece of pump pipe becomes detached and falls into a shallow well, it can be "fished" out easily with the tool shown. It is a length of iron bar bent as indicated and slipped tightly into the end of a long pipe, which serves as a handle. In use, the bar is lowered into the well and then moved around to slip the hooked end of the tool over the pipe, after which the tendency of the pipe to tip downward at one end binds it in the hook so that it can be lifted out.

—Carrol Baxter, Beecher Island, Colo.

Wrench to Turn Wing Nuts from Pipe Fittings

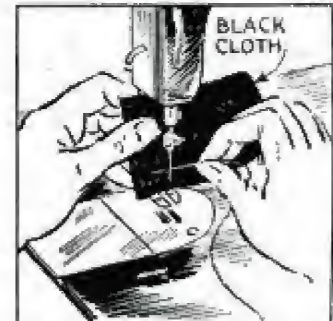


Here's a handy little wrench that will turn tight wing nuts easily. It consists of a pipe tee with a short nipple turned into one of the openings to serve as a handle. The open ends of the tee are slotted to slip over the wings of the nut as indicated in the drawing. The slots in the

two openings should be of different sizes so one side can be used for small wing nuts and the other for large ones.

Black Background Helps in Threading Needle

Difficulty in seeing the eye of your sewing-machine needle when threading it, may be overcome by holding a piece of black cloth or paper behind it as indicated. This provides a black background against which the needle will stand out clearly in contrast so that the eye can be seen.



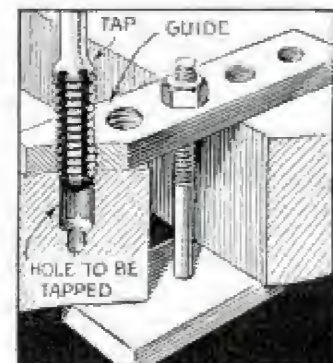
Medicine Tray for Sick-Room Bed Made from Soap Holder



A metal soap holder of the type shown may be used to hold a glass of water or bottles of medicine on the bed of a sick room. The hook can be bent to fit any size of bed rail.

Jig Aids in Tapping Blind Holes

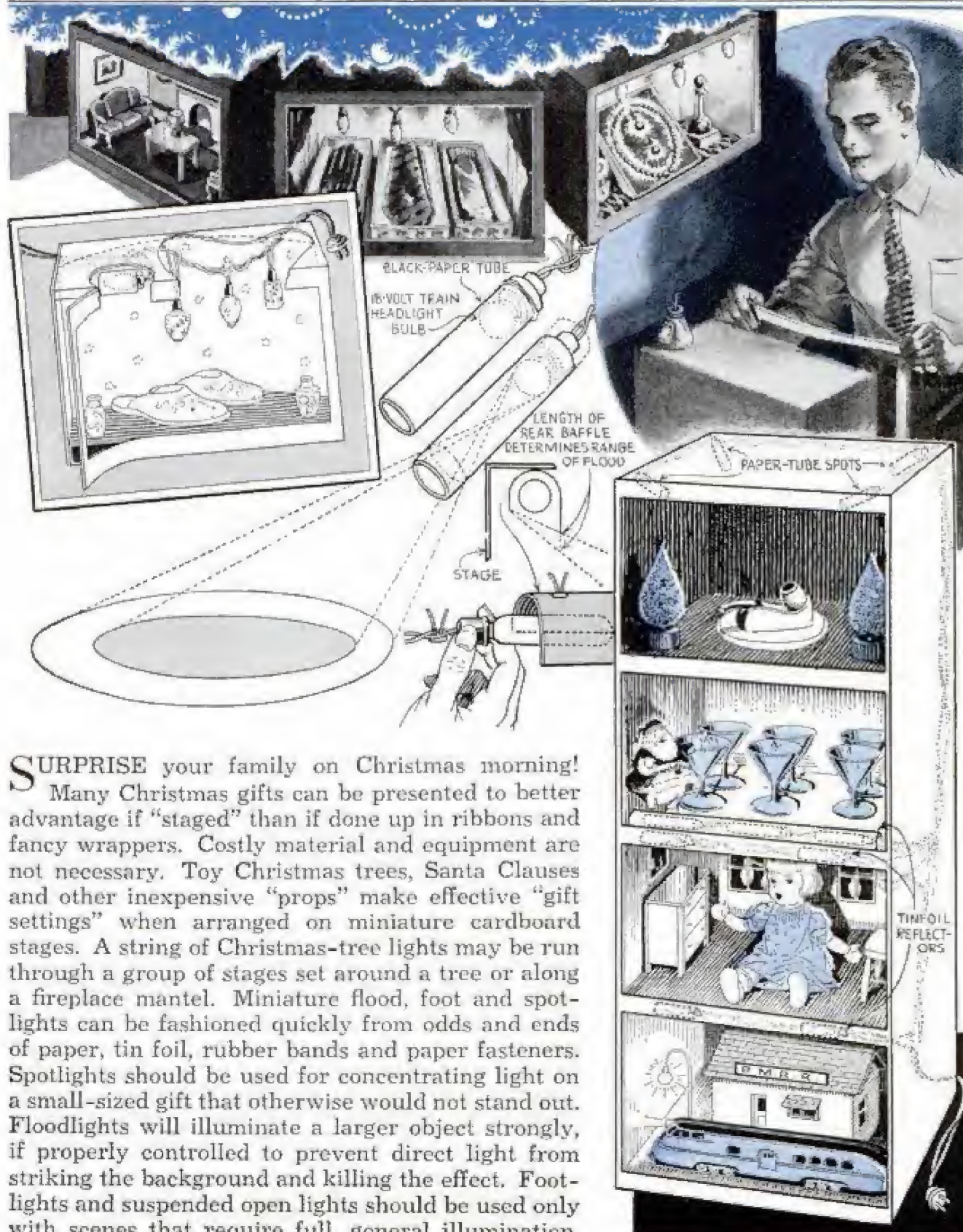
Starting a tap straight to thread a blind hole is made quite easy by using a guide like the one shown. It's a piece of flat iron in which holes of different sizes have been drilled and tapped. In use, the guide is clamped over the work as indicated, and the tap is started into one of the holes of the right size, which guides it accurately into the hole which is to be threaded.



—F. Doughty, Yorks, England.

"Stage" your

CHRISTMAS GIFTS



SURPRISE your family on Christmas morning!

Many Christmas gifts can be presented to better advantage if "staged" than if done up in ribbons and fancy wrappers. Costly material and equipment are not necessary. Toy Christmas trees, Santa Clauses and other inexpensive "props" make effective "gift settings" when arranged on miniature cardboard stages. A string of Christmas-tree lights may be run through a group of stages set around a tree or along a fireplace mantel. Miniature flood, foot and spotlights can be fashioned quickly from odds and ends of paper, tin foil, rubber bands and paper fasteners. Spotlights should be used for concentrating light on a small-sized gift that otherwise would not stand out. Floodlights will illuminate a larger object strongly, if properly controlled to prevent direct light from striking the background and killing the effect. Footlights and suspended open lights should be used only with scenes that require full, general illumination.

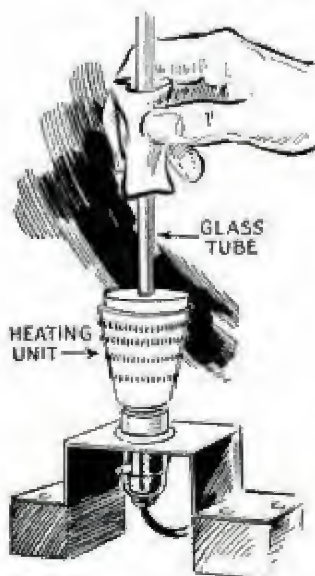
Pressure Foot on Coping Saw Holds Down Work



This pressure foot will keep small or thin work from moving up and down while cutting it with coping saw

Fastened to the frame of your coping saw as indicated, a pressure foot will help keep small or thin work from moving up and down while cutting it. The foot is cut from spring brass or steel and is riveted to the saw frame. If desired to have the foot adjustable, it can be fitted with small bolts and wing nuts so that it can be clamped in place.

Glass Rods Quickly Softened in Electric Heater



made in the cover large enough to admit the glass to be worked. If tubes of differ-

ent sizes are to be used, it is a good idea to make a cover to fit each one. If desired, the temperature inside of the unit can be increased considerably by removing a 10 or 12-in. length of the coil-resistance wire from the outside.

ent sizes are to be used, it is a good idea to make a cover to fit each one. If desired, the temperature inside of the unit can be increased considerably by removing a 10 or 12-in. length of the coil-resistance wire from the outside.

—Dale R. Van Horn, Lincoln, Nebr.

Water Pipes under Coal Pile Corrode Rapidly

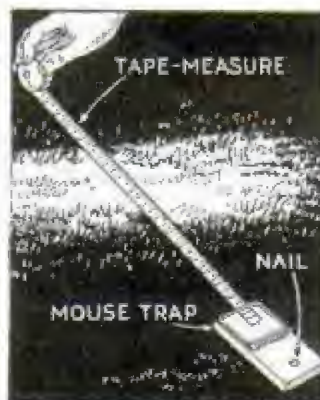
Corrosion of gas and water pipes where coal is stacked against them may soon result in serious leaks. The pipe shown in the photograph was corroded halfway through after coke had been piled against the pipe for a few months. It had but little farther to go to release gas into the basement, when discovered.



Any pipes against which coal or coke may be piled in a coal bin should be painted and taped or covered with wood strips.—C. E. Packer, Chicago.

Anchoring End of Tape Measure

When using a long tape measure single-handed, an ordinary mousetrap makes a good holder for anchoring one end of it. The base of the trap is drilled to take a nail, the end of which is ground to a short point. In use, the end of the tape measure is clipped under the trap jaw and the nail used to anchor it securely to the ground or other surface which is being measured.



—Charles Latour, Albany, N. Y.

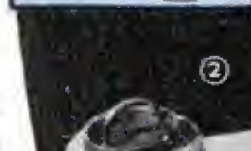
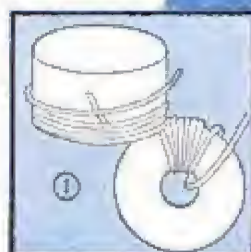
❏ You can dice sliced pineapple easily before emptying it from an opened can by inserting a sharp knife into the center and cutting outward.

Crepe-Paper NOVELTIES

by
E. Vogt

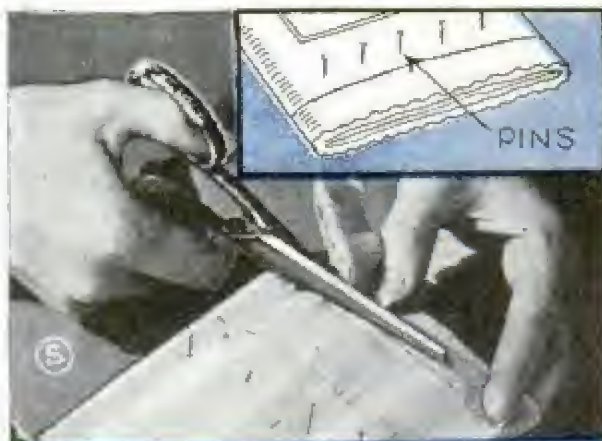
THERE'S no end to the number of things you can make from colored crepe paper. The work is interesting and instructive for young and old alike, and there are possibilities of making this hobby a profitable spare-time business as there is always a demand for clever novelties.

Crepe paper lends itself especially to the forming of pulled "raffia," which can be wrapped over articles or it can be woven and braided. Among the things decorated with crepe-paper raffia are picture frames, lamp bases and shades, wastepaper baskets, fancy flowerpot covers, and all sorts of square, rectangular and round containers to the surface of which the raffia is glued. A group of such items is shown in Fig. 2. Figs. 1 and 3 indicate the method of applying the raffia, while Fig. 4 shows a basket consisting of an old phonograph record which was bent while softened in hot water, and covered with raffia strips after it had hardened in the shape it was formed. The raffia strips radiate out from the center and the wire handles are wrapped. Two other items, in the making of which somewhat similar technique is used, are the tie racks shown in Fig. 6. The upper one consists of heavy cardboard or light plywood, two spools and a piece of heavy wire, all neatly wrapped with raffia. The lower tie rack—or towel rack if you wish—is cardboard



NOVELTIES
DECORATED WITH
SINGLE STRIPS OF
CREPE "RAFFIA"





CUTTING CREPE -
PAPER INTO STRIPS

on which three wrapped fruit-jar rings are mounted. Of course, different colors are used to obtain pleasing contrast.

In making the raffia it is essential to get the best grade of crepe paper which will not break easily when pulled through the "twister." The latter is a small block of wood having two holes of different sizes, through which strips of the crepe paper are pulled. The twister can be purchased for a few cents at almost any department or variety store. You can cut the $\frac{1}{2}$ or 1-in. strips directly from a 10-ft. "fold" of the crepe paper, as you buy it at the store. Pins are used to hold the fold from shifting while you are cutting the end with a pair of sharp scissors. As the cut strip will be 10 ft. long, the pulled raffia will be about twice as long. Children who are cutting the crepe paper into strips may have to unfold it in case they cannot cut through several thicknesses of the paper as just described and shown in Fig. 5. The small hole in the twister takes the $\frac{1}{2}$ -in. strips and the large hole takes the 1-in. strips. To start the paper strip through the twister, you cut off one end diagonally so that it tapers to a point. This you roll tightly to form a "needle" which will pass through the hole in the twister. Holding it in the left hand, let the paper pass between your thumb and finger as shown in Fig. 7, so you can apply a slight pressure while pulling the paper through with your right hand.

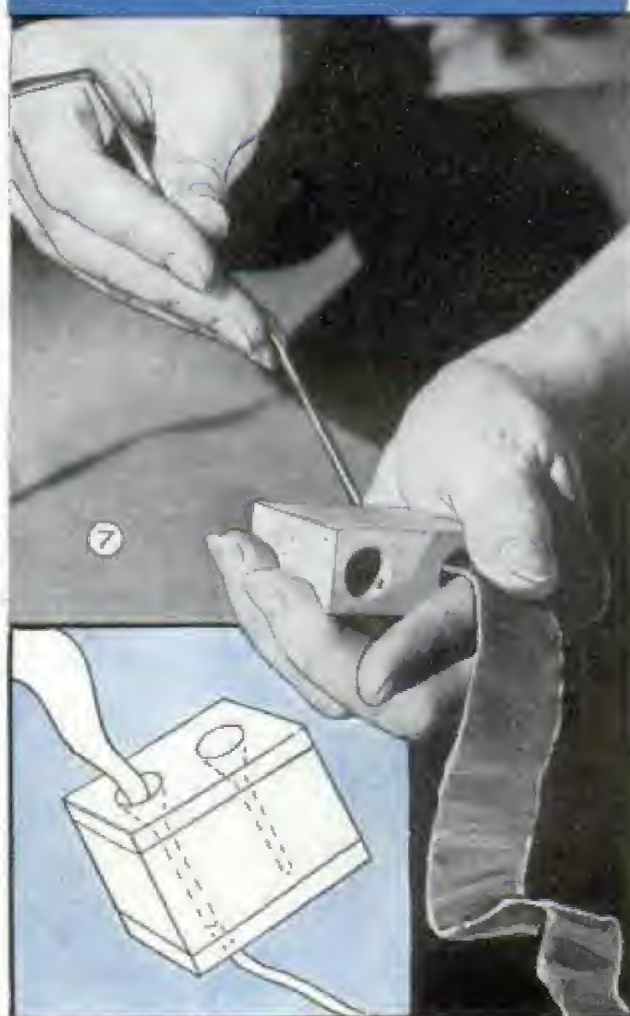
The object of holding the paper between your thumb and finger is to stretch it. However, children often find it convenient to stretch the paper as a separate operation before pulling it through the twister. If desired, the strands can be given additional twisting after being pulled through. The paper must not be jerked at any time—an even, gentle pull will produce the desired results.

While many objects can be suitably decorated by wrapping them with the single strips of raffia, another class of work involves braided

ed raffia. In this, gay color combinations can be used for artistic effects. The completed braids may be glued to the surface of articles or the braided lengths may be glued together, depending on the purpose of the finished article and the strain to which it is subjected. In this group are mats for hot dishes, shal-



TWISTING CREPE-PAPER STRIPS



low trays or deeper containers, bowls, candlesticks and ornamental match boxes, examples of which are shown in Fig. 11. Among possibilities not shown here are fancy cigar boxes, candy or cookie jars from ordinary tin coffee cans. Likewise, baking-powder cans are converted into cigarette containers; mailing tubes into knitting-needle cases, and odd-shaped bottles into vases and lamp bases. The process of forming such items consists first of all in braiding the strips of pulled raffia as shown in Fig. 8, after which paste is carefully applied under each layer while the winding progresses, Fig. 9. When thoroughly dry, the finished article is given a few coats of shellac as in Fig. 10. Shellacking keeps the braid in place more effectively than paste only, adds durability and makes the braid moisture resistant.

Another purpose to which the pulled crepe-paper raffia lends itself is weaving, which enables you to make colorful as well as durable pillow covers, knitting bags, purses, belts and numerous other items. For pillow covers and knitting bags, you get ordinary five-cent dish cloths. The cloth may be dyed a contrasting color to the paper to be used for weaving. For pillow covers, two wash cloths, woven separately with the raffia, are sewed together at the edges. The same process is used in making knitting bags but in this case two edges of the woven cloths are attached to wooden handles. The finished "fabric" is flexible, yet it has sufficient body so that it will keep its shape.

Besides the various types of work already mentioned, the making of small dolls is a pop-

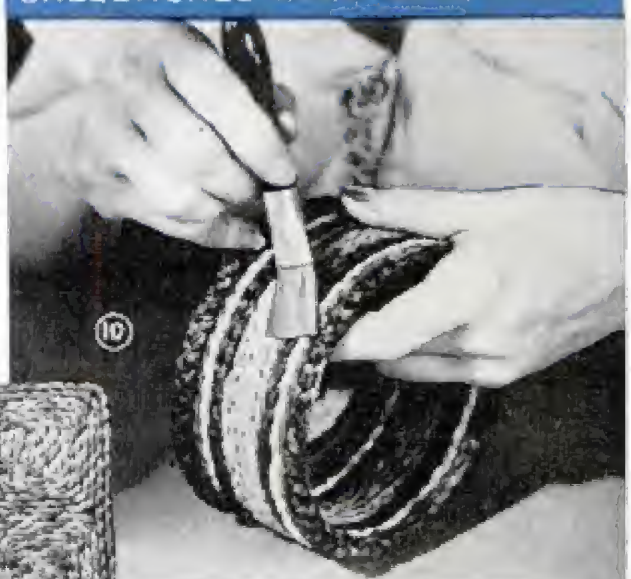
BRAIDING CREPE
"RAFFIA" STRIPS



PASTE IS APPLIED UNDER
EACH LAYER OF BRAID



SHELLACKED WHEN WORK IS DRY



USEFUL ARTICLES
IN BRAIDED CREPE





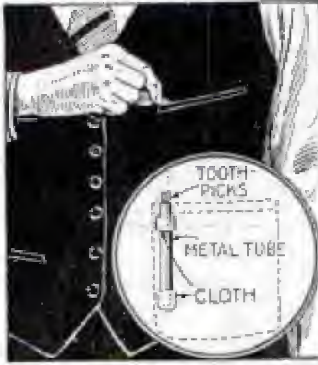
ular and fascinating pastime for the enterprising crepe-paper crafter. You can make the dolls simply for the purpose of ornament, to be given away as party favors, or they may be designed for some definite useful purpose, which will, of course, determine the exact method followed in constructing them. They make attractive lamp and curtain pulls, or they can be used as decorative doorstops, the roomy dress covering a suitable weight. Another interesting job is the making of crepe-paper animals. You start with the skeleton, a framework of wire. This is covered with padding on which the raffia is wound.

Or, you may prefer working with crepe-paper "clay," to form various pieces of pottery. To make the clay, cut off a 1-in. sec-

tion from a fold of crepe paper, stretch it and soak it in water, $\frac{1}{2}$ cupful. While the paper is wet, cut it into "confetti." Then gradually add flour, $\frac{1}{2}$ cupful, and water, $\frac{1}{2}$ cupful. Mix thoroughly with a wire potato masher until the mass assumes the consistency of bread dough. One fold of crepe paper will make 4 cupfuls of finished "clay." A tablespoonful of salt or powdered alum added to this will prevent the formation of mold on the clay, which may happen when it does not dry quickly. Crepe clay can be applied as a permanent covering to vases, bowls and other objects. If the clay is to be removed from the foundation, cover the latter with wax paper to make removal easy. A coat of white shellac will add gloss and durability.



Toothpick Holder for Pocket



Those who are in the habit of carrying toothpicks in their pockets will find that a metal-tube holder not only helps to keep them clean, but also avoids breakage. A metal handle from an old mucilage brush

makes a good tube when cleaned, and is attached inside the pocket by cloth strips sewed to the lining as shown.

Ring Measurement Taken with Wooden Spoon

When you want to give a ring to some member of your family, and there is nothing at hand with which to take the measurement, try using a wooden spoon or a paddle whittled out to similar shape. In use, just take a ring that the person is already wearing and force the end of the spoon into it tightly. This will leave small indentations on the edge of the wood from which the jeweler can take his measurement.—F. Bentley, Jr., Missouri Valley, Ia.



Passing It On to Others

Although the solution of many minor everyday problems around the home, in the workshop, concerning the car, or pertaining to your daily work, may seem rather insignificant to you, there are perhaps thousands of others who have the same problems. If your solution was unusual, but simple and practical, why not pass it along to others to help them? These pages are a "clearing house" for such ideas and if you have any new ones that are exceptionally outstanding, don't hesitate to tell us about them. We are always looking for such short cuts that will save time, work and money. And, of course, we will send a check in payment for anything that we use.

Write to Shop Notes Editor

POPULAR MECHANICS MAGAZINE

200 E. Ontario St.

Chicago

Newspaper Carrier of Stiff Wire Leaves Both Hands Free



A paper is removed from this bag with one hand while making change with the other one

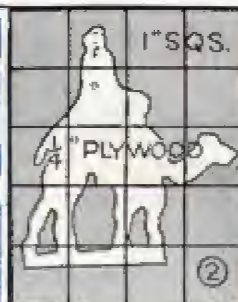
Instead of using both hands to remove a paper from his shoulder bag, one to hold the bag open and one to lift the paper, this newsboy uses a wire frame from which a paper can be removed with one hand, while making change with the other one. The frame is made of fairly heavy wire, and all joints are soldered, a strap being attached to go over one shoulder.

Markers for Loose-Leaf Books Made from Shipping Tags

Markers for loose-leaf books are quickly made from shipping tags as indicated. The eyelet of the tag makes it easy to attach over one of the metal rings of the book, and the projecting portion of the tag provides a surface on which to write data which serve as an index.

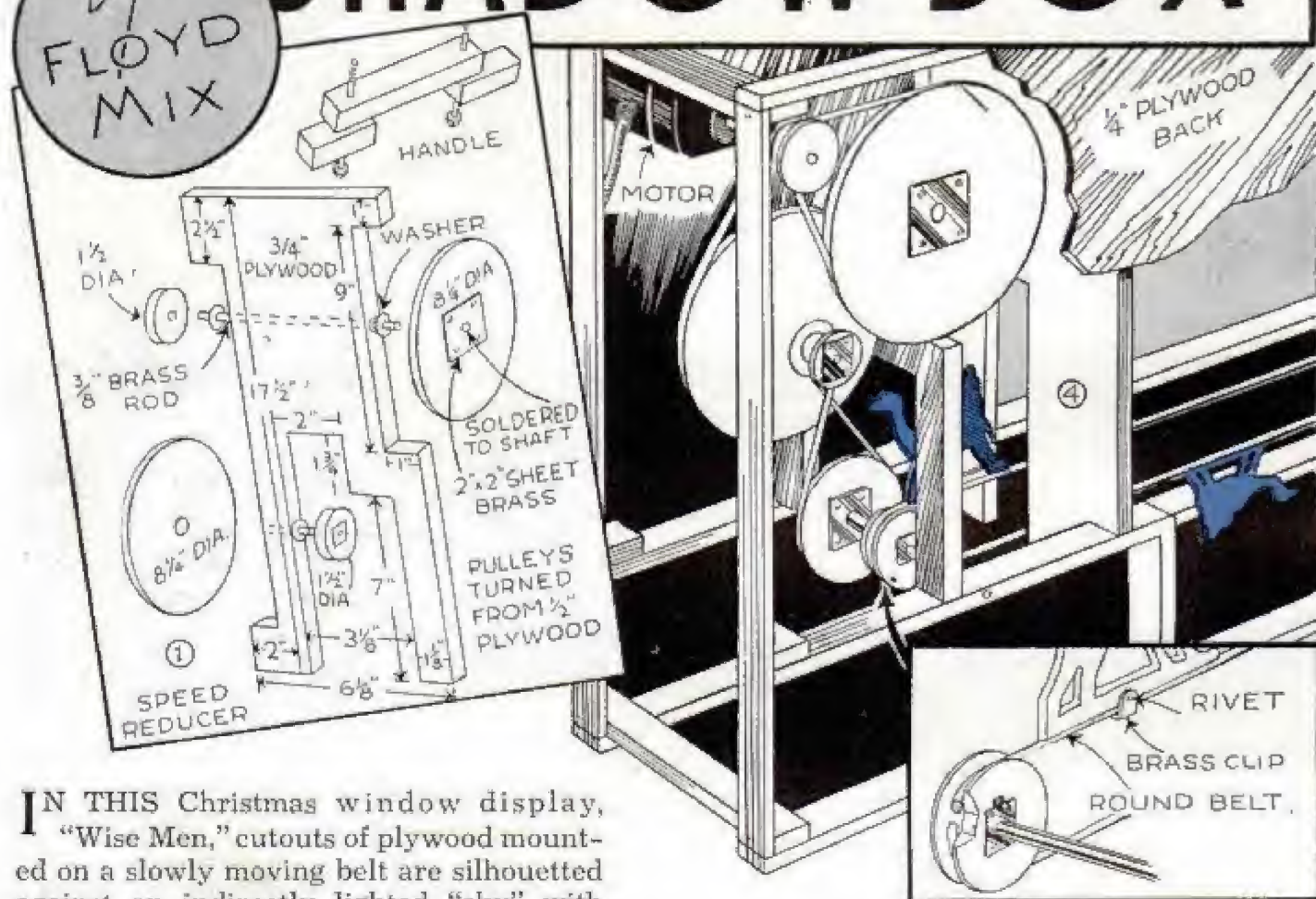


Moving Pictures in Yuletide



SHADOW BOX

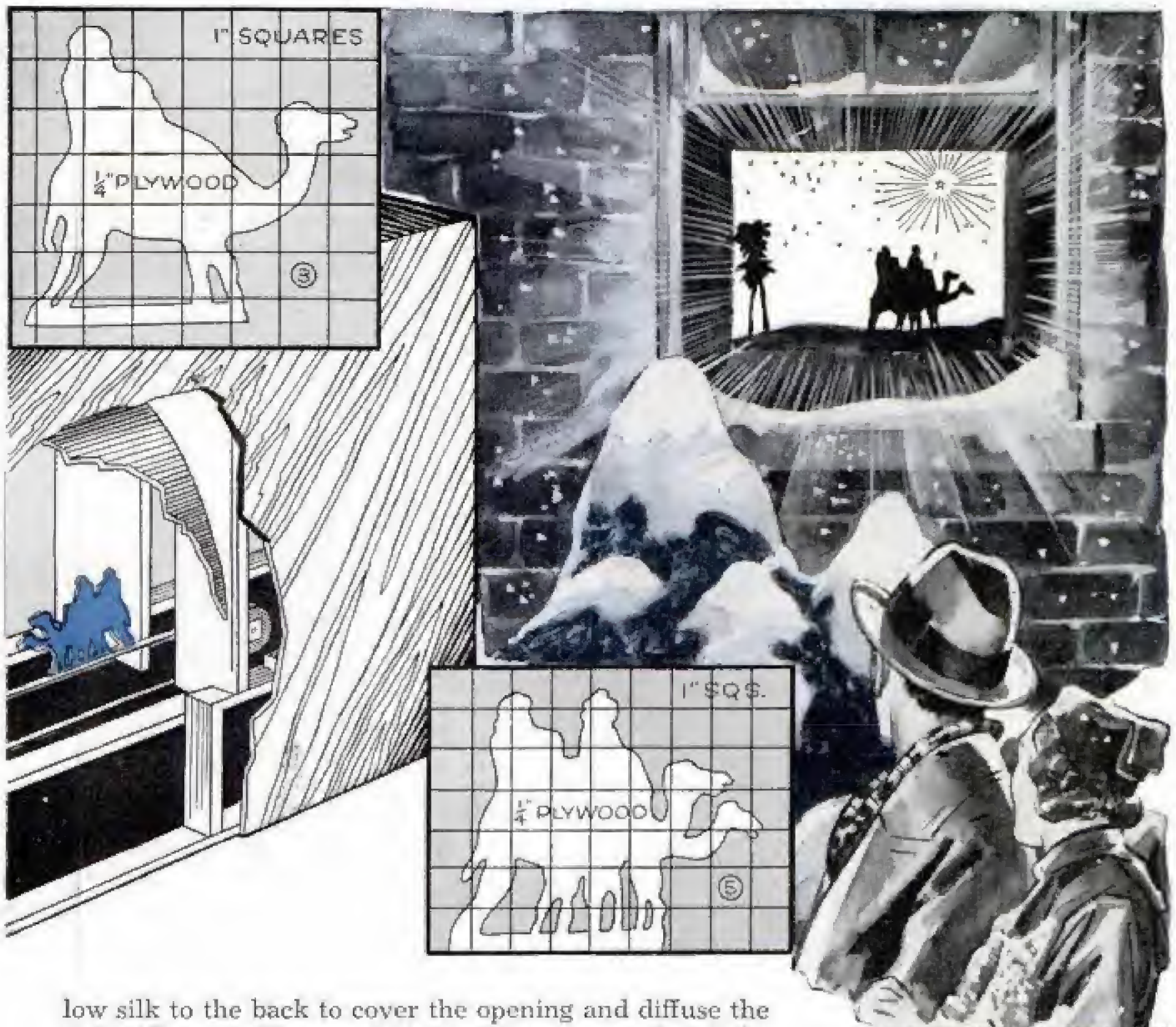
by
FLOYD
MIX



IN THIS Christmas window display, "Wise Men," cutouts of plywood mounted on a slowly moving belt are silhouetted against an indirectly lighted "sky" with prominent stars, to create a typical Eastern desert scene.

Essentially, the display consists of a plywood-covered box with an opening in one side for a miniature stage, small electric motor, speed-reducing unit, and means for controlling the light from three showcase lamps. Construction begins with the frame, Fig. 8. The required parts are ripped from $\frac{1}{2}$ and $\frac{3}{4}$ -in. stock, almost any kind of wood being suitable, and assembled with flat-head screws. The heads must all be countersunk flush with the surface. Fig. 11 shows a cutaway view of the operating mechanism and bristol-board sky. The

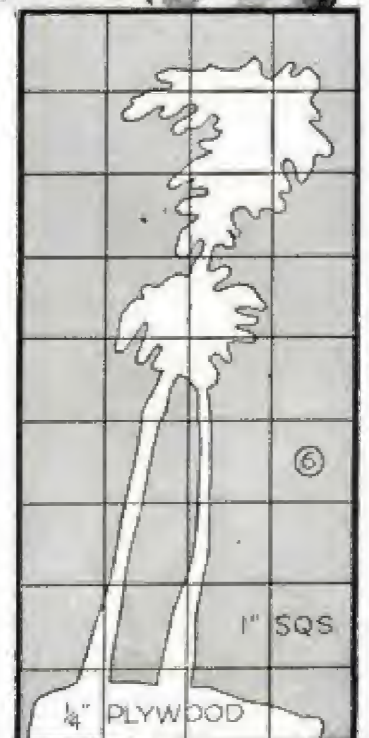
belt trough, which also serves as a guide to keep the figures in a vertical position on their trips across the stage, consists of a wood core, $\frac{3}{8}$ by $1\frac{1}{4}$ in., onto which strips of sheet metal are nailed as indicated in the cross-sectional view. Upright pieces which support the sky are next sawed out and nailed to the frame cross-pieces. When these are finished, cleats to hold the bristol-board sky are cut and fitted in place, and the board trimmed to fit. Before tacking it down, make a cutout of a large five-pointed star in the upper right-hand corner and glue a piece of yel-

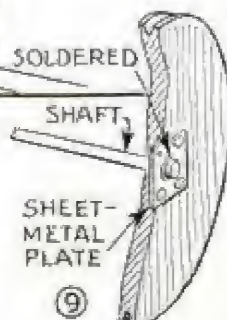
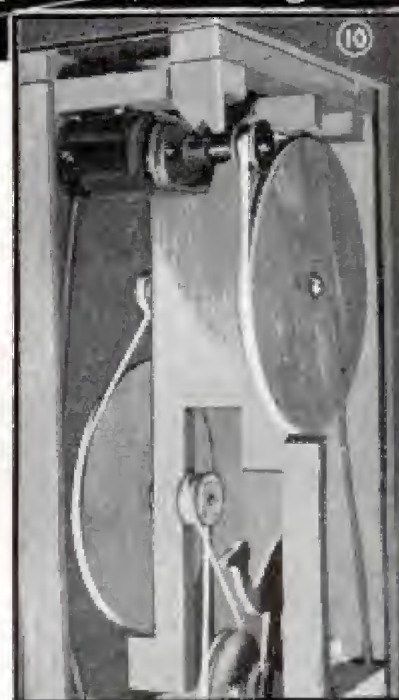
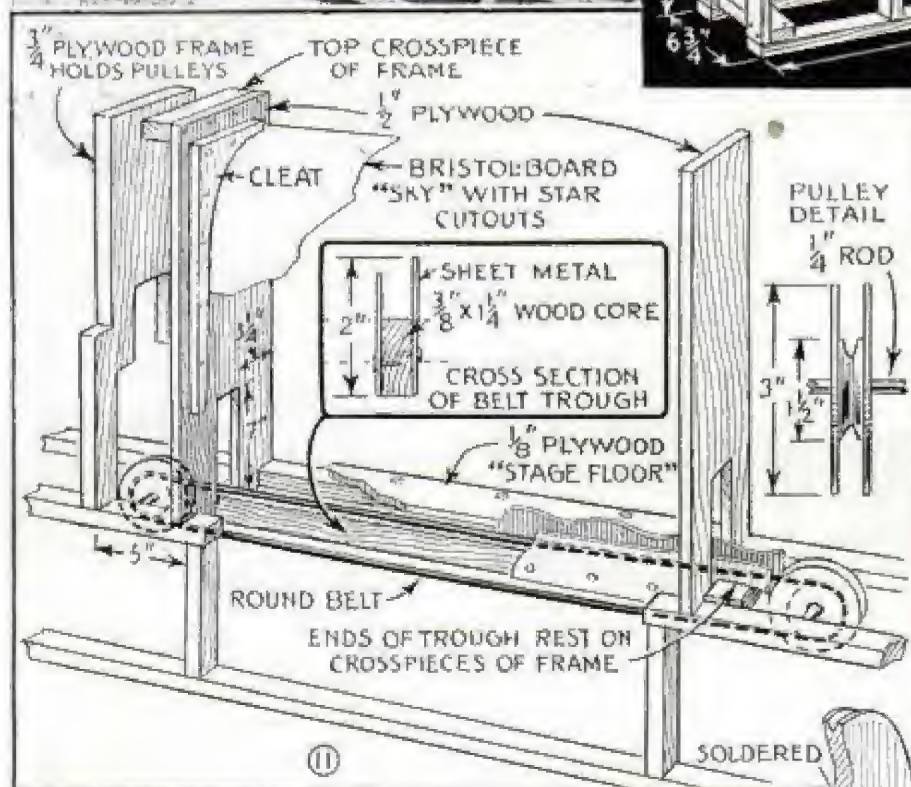
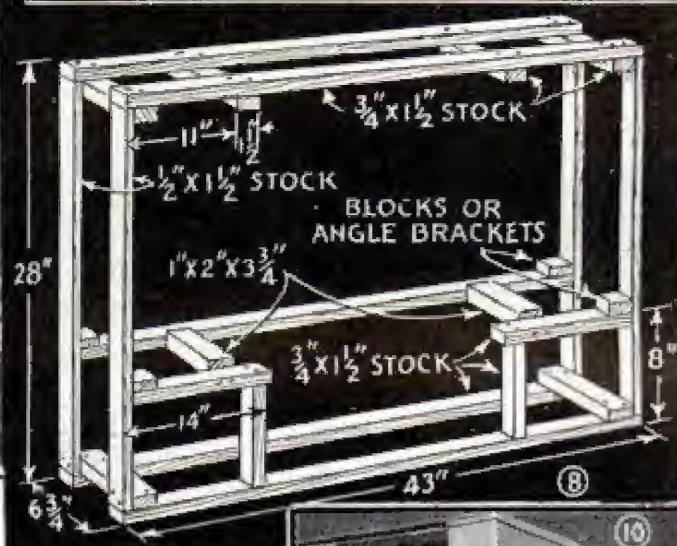
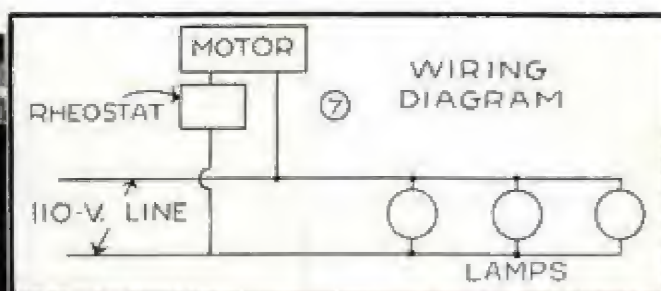
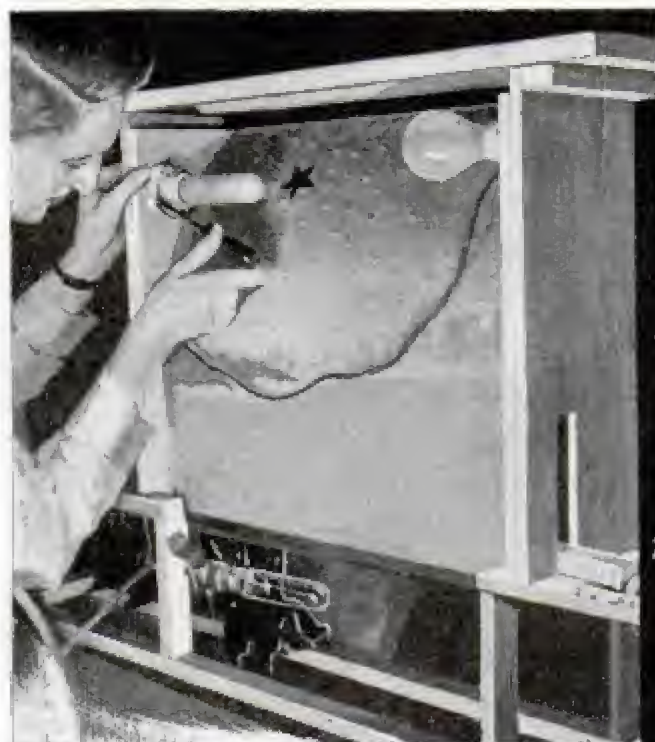


low silk to the back to cover the opening and diffuse the light. Then, drill several $\frac{1}{16}$ -in. holes to simulate light rays and small stars.

Fig. 1 gives dimensions of the various parts required for the speed reducer. Jigsaw the pulleys to the approximate shape and true them up on a wood-turning lathe. The surface of each should be recessed approximately $\frac{1}{4}$ in. to take a belt composed of several strands of stout cord. Also turn the pulleys for the trough belt. Use $\frac{3}{4}$ -in. plywood for these pulleys, turning two to the dimensions shown in one of the details, Fig. 11, and the other to a diameter of 6 in. The manner in which all the pulleys are mounted is illustrated in Fig. 9. Fig. 10 shows the motor in place, and Fig. 7, a wiring diagram. Whether or not you will need a rheostat to help control the speed of the motor depends on the one you have at hand, and can best be determined by experimenting. Now for the plywood cutouts, Figs. 2, 3, 5 and 6. Lay off 1-in. squares on a piece of wrapping paper, sketch the design given in the small squares into the large ones freehand, trace them onto $\frac{1}{4}$ -in. plywood and saw out one of each. The camel cutouts are mounted on a $\frac{1}{4}$ -in. leather belt of the sewing-machine type, using brass clips as illustrated in the detail, Fig. 4.

Illumination for the display is provided by three lamps, as



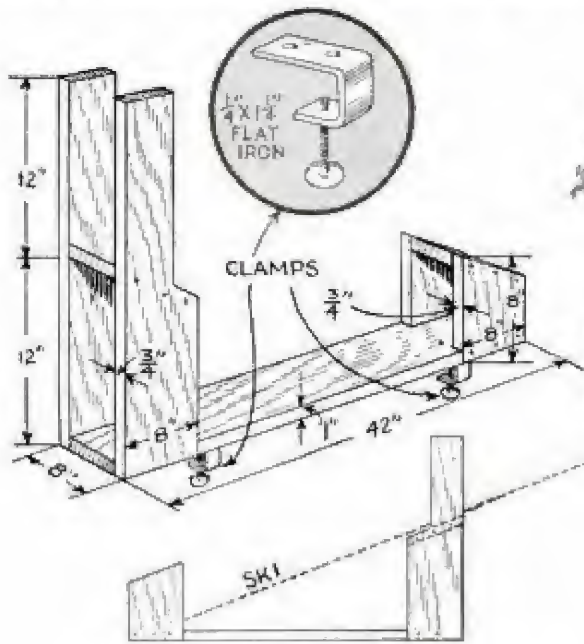


shown in the photo at the left of Fig. 7. Two of the lamps keep the stars glowing and light from the other shines up through a gap between the bristol board and belt trough. After the wiring of the lamps is completed, the frame work is boxed in with $\frac{1}{4}$ -in. plywood. A layer of adhesive tape is used in all joints to make them lightproof. Nails can be used in fastening the front panel, but the side and back panels should be screwed in place so they can be removed readily to make minor adjust-

ments. Following this the various parts are stained and painted. The sides of the moving figures and palm-tree cut-outs are painted black, the edges being left unfinished. Bright blue

water color is used on the bristol-board sky. The exposed surface of the plywood is given a coat of walnut oil stain, and if the display is to be used outdoors, a couple coats of shellac.

Homemade Ski Carrier Fits on Running Board



Overcoming the difficulties of transporting bulky skis and poles on a car, this carrier, made from scrap lumber, is securely clamped to the running board. There's a "heel box" at one end, which keeps the skis and poles nested together snugly. A crosspiece nailed between two uprights



serves to hold the skis above the front fender. Clamps from an old luggage carrier can be used to hold the ski carrier on the running board. Five pairs of skis can be carried conveniently and they do not extend beyond the limits of the car. Of course, it's a good idea to keep some burlap handy for wrapping the skis in order to avoid marring the finish of the car.

Bed Table for Sick Room Improvised from Card Table

When some member of your family must stay in bed for a while, and desires a "desk" on which to read or write, take your folding card table, open two legs and set it on the bed as indicated. Card tables are usually light so that the end of the table resting on the patient's body is not uncomfortable. If it is, however, pillows or books can be placed on each side of the

patient to carry the weight. A small desk lamp can be clamped to the upper edge of the table to provide illumination.

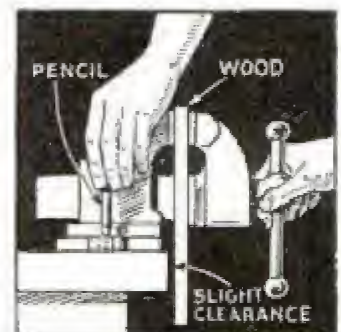
—Robert M. Eadie, Granum, Alberta, Can.



It takes only a minute to improvise this reading or writing table for a bed patient

Vise Jaw Should Clear Bench

Before mounting a vise permanently on a bench, clamp two wood blocks in the jaws, one on each side of the screw and extending several inches below the base of the vise. Then place the latter on the bench at the desired location, being sure that the blocks clear the bench edge a little, and that both blocks clear the same distance. This mounting assures that long pieces of work can be clamped vertically in the vise without striking the bench.



Extra Chair Seat Raises Child at the Table

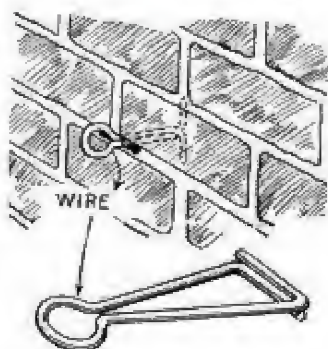


Placed on a regular chair, this extra seat raises a child so that it can reach the table comfortably

After your child has outgrown the high chair, but is still too short to reach the table comfortably when sitting on a regular chair, this extra seat will solve the problem. It is cut from a piece of plywood to approximately the same shape as the chair seat and rubber-tipped doorstops are screwed to the underside at each corner.

—Axel E. Ogren, Chicago.

Fasteners to Attach Articles to Brick Walls



in the detail. To anchor it in the wall, mortar is removed from between two bricks,

Here's a good fastener to put in a brick veneer wall when it is desired to hang or secure something to it. The fastener is made by bending a length of fairly strong wire to the shape shown

making an opening wide enough to insert the fastener, which is then twisted at right angles to bring the edges of the fastener into the position indicated by the dotted lines in the drawing. The space between the bricks is then filled with mortar to hold the fastener securely in place.

Pocketknife Has Finger Shield for Carving and Whittling

When using a pocketknife to carve or whittle wood, slip a small sponge-rubber ball over the blade, as indicated, on which to rest the tip of your index finger. You'll find that this keeps the blunt edge of the blade from "cutting" into the finger,



which is rather painful when the knife is used for long periods. Once a slot is made in the ball it slips on or off easily.

Pulling Wires through Conduit

The next time you have a number of wires to pull through a conduit, try using a piece of radio shielding over the ends, as shown in the photo. This provides a thim-



Radio shielding slipped over ends of wires so that they can be pulled through conduit easily

ble to keep the wires together and prevent them from catching against the side of the conduit. The pulling strap or wire is hooked into the shielding and the pull applied at the other end of the conduit.

—Ivan Grosvenor, Richmond, Ind.

☐ Tar spots may be removed from the hands or face by rubbing them with olive oil, or a piece of freshly cut lemon.

"BOWL-O"

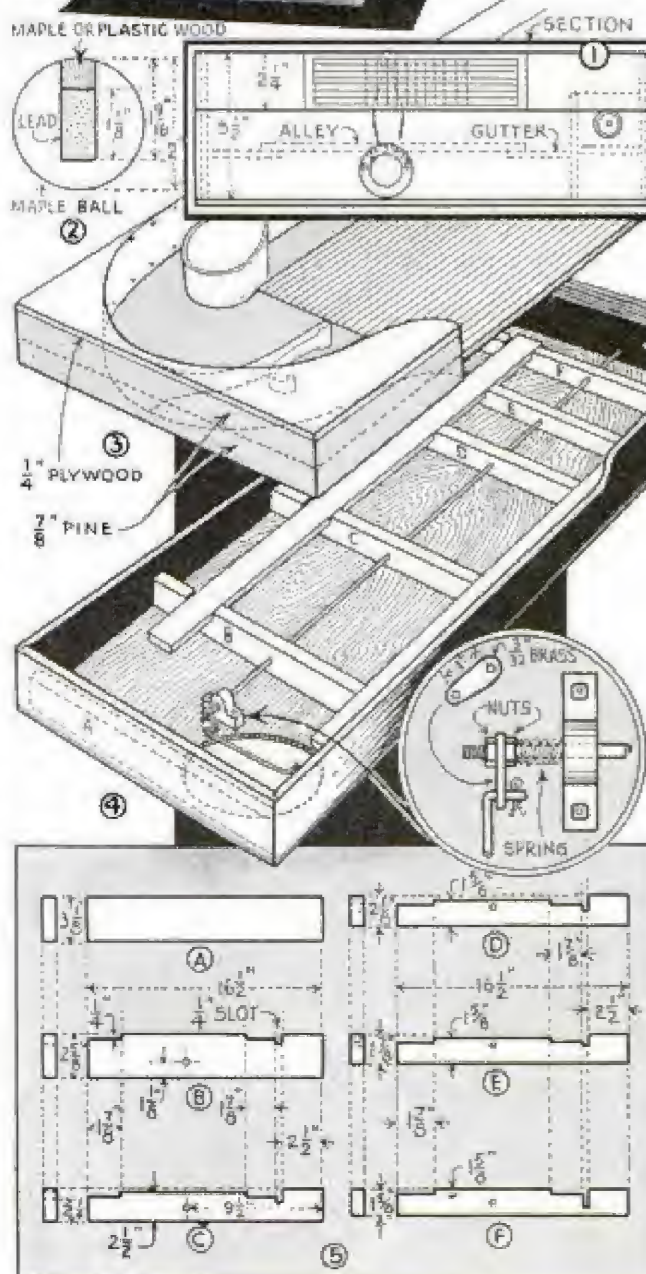
*a table-top
bowling
game*

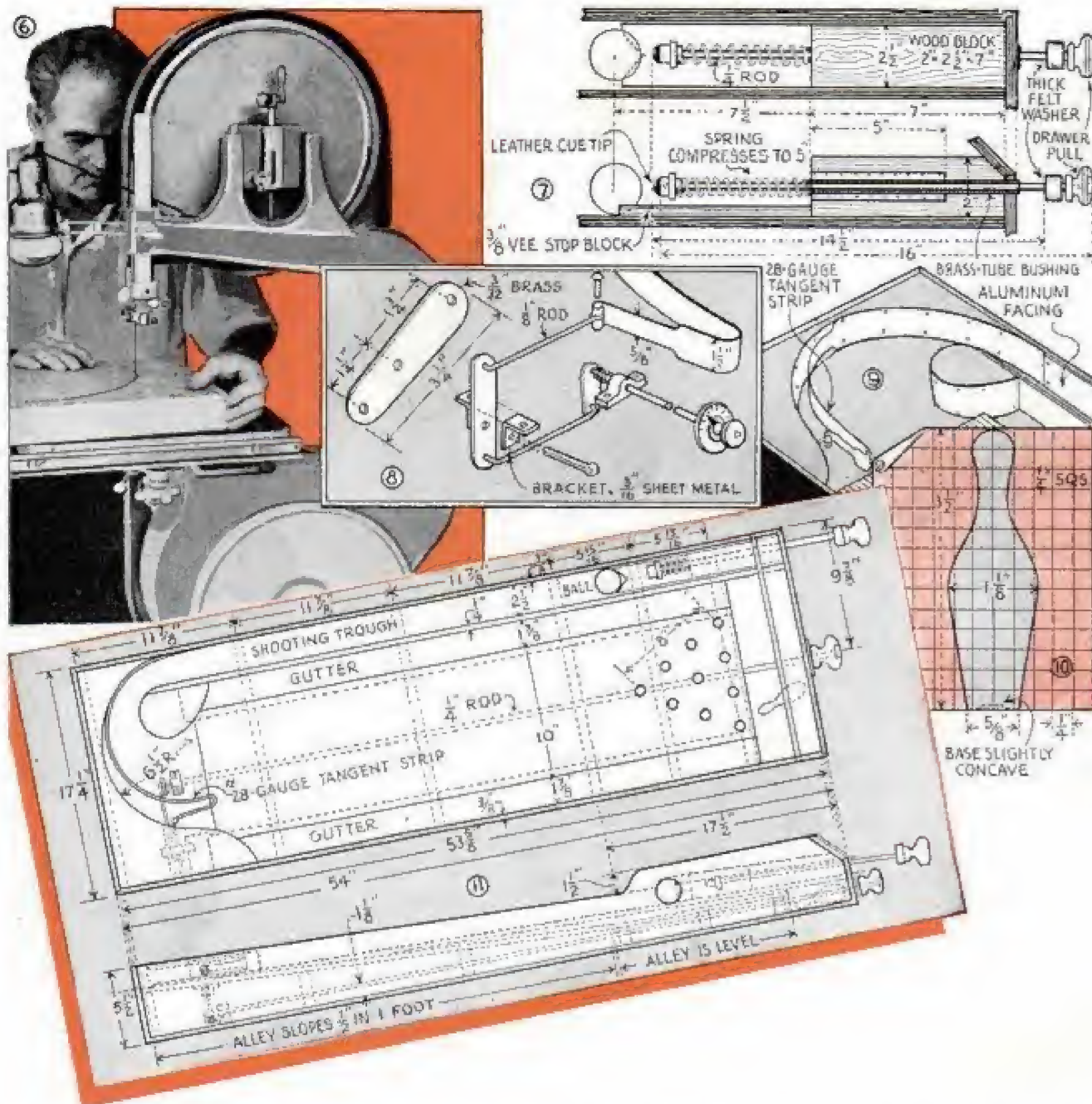


NOW you can enjoy bowling right in your own home. The mechanical features of this table-top alley are much like the familiar pin-ball game, but with this important difference: Quick, accurate judgment and manual skill are what it takes to win. The nature of the construction practically rules out the element of pure luck.

Essentially, as you will see, it's a miniature bowling alley complete with gutters, pin spots and pit. Only one ball is used, however. This is shot up a trough and follows a guide rail which ends in an adjustable tangent spring, the arc of which can be changed by turning a graduated knob at the end of the game cabinet, Fig. 1, thus directing the course of the ball to any point at the lower end of the alley. Now you cannot set the tangent spring by trial and thus guide the ball consistently for a strike, for there is another factor: The force with which the ball is shot up the trough must be gauged very carefully, as the slightest distortion of the tangent spring will deflect the ball from its course; hence that nicety of control which is the problem of each player individually. Otherwise the game is the same as conventional bowling.

The cabinet is built first, Figs. 4, 5 and 11. A 4-in. handhole is cut near the upper end of the bottom to give access to the mechanism operating the tangent spring. Then get out the cross members, from $\frac{3}{4}$ -in. stock, Fig. 5, boring a hole in all but





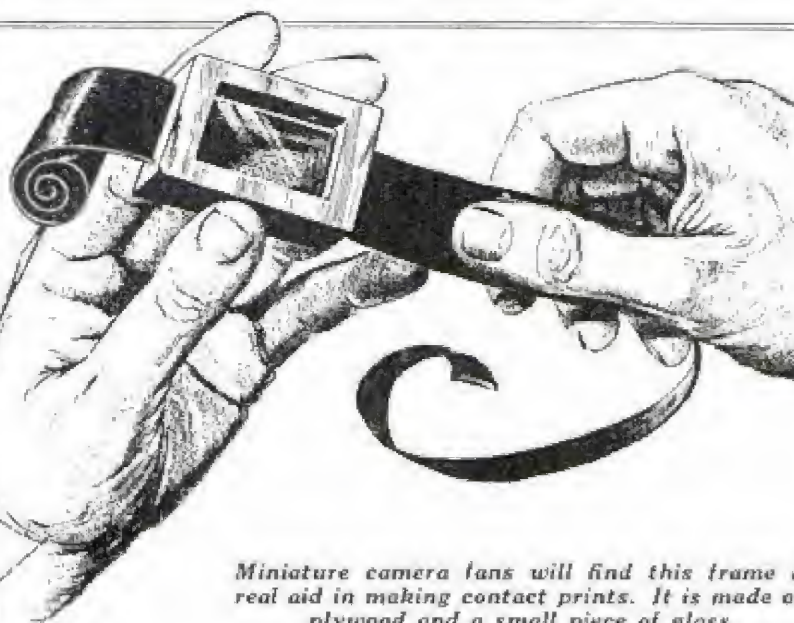
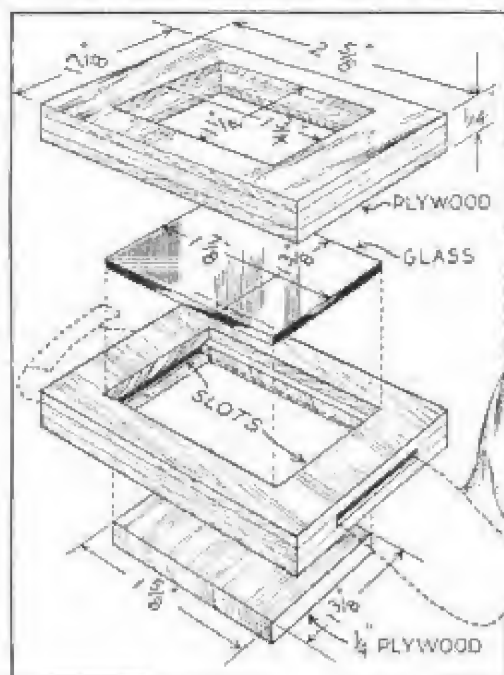
one for the tangent spring control rod. One end of the latter is fitted with a large wooden drawer pull. The alley can be made of $\frac{3}{8}$ -in. fir plywood or birch of the same thickness. Before you cut this to the finished length, it's best to get out the curved blocks which form the guide for the ball at the top of the alley, Figs. 3, 6 and 9. Some fitting will be necessary when assembling these parts. The gutters fit into notches in the cross members A to F in Figs. 4 and 5, also, the inner side of the ball trough fits in a vertical position against the edge of the gutter.

Figs. 7 and 8 detail the mechanism which controls the movement of the ball, the latter being turned from a block of maple and loaded with lead as in Fig. 2.

The plunger which propels the ball up the trough is actuated by a compression spring and is bushed through a wood block with a piece of brass tubing as shown in Fig. 7. The ball trough is lined with sheet aluminum up to the point where the curve begins, as in Fig. 9. From this point on, the facing is merely a continuation of the tangent strip, which can be made of brass or duralumin. About all that's left to do is turn out the pins, Fig. 10, from hard maple, draw the parallel lines on the alley with India ink and then finish up with shellac and varnish.

¶ When rush photos are required, you can print from a wet negative, if both sides of the negative are covered with Cellophane.

Film Slides Through This Miniature Printer



Miniature camera fans will find this frame a real aid in making contact prints. It is made of plywood and a small piece of glass

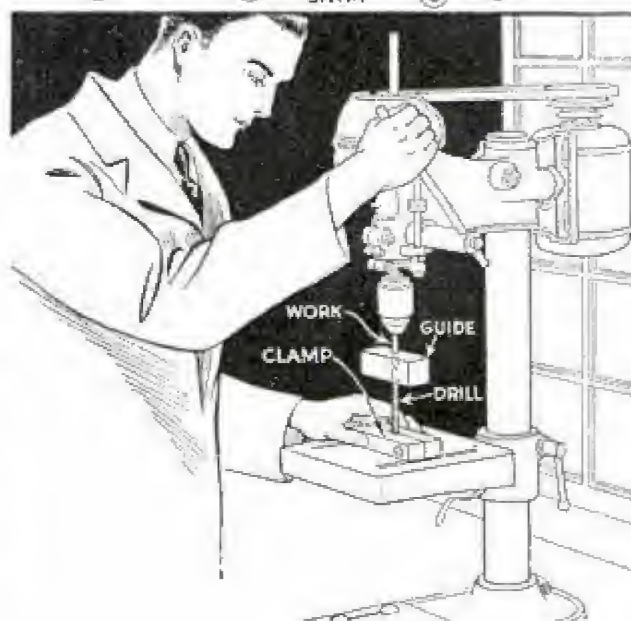
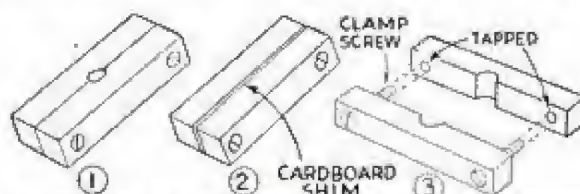
There's no need to cut your miniature film into various short lengths for contact printing as this small frame enables you to slide the film along to any exposure. Two pieces of light plywood with cutouts of different sizes are glued together. The lower one has the larger cutout and also a slot at each end to take the film. A piece

of glass is cut to fit rather snugly inside the slotted piece and a frame backing piece, a little smaller than the glass, is also provided. The glass is inserted and then the film is pushed through, after which a piece of printing paper is held against the negative by the backing piece, which can be hinged to the frame with a strip of tape.

Jig for Spotting Center Holes in Round Rods on Drill Press

This simple jig solves the problem of spotting a hole on center in the end of a small rod. In effect, the drilling is done upside down as the drill bit is held in a clamp on the machine table while the work is gripped in the chuck. As an example, assume that the rod to be centered is $\frac{1}{4}$ in. in diameter. Drill a $\frac{3}{32}$ -in. hole through a square of cold-rolled steel. Then ream the hole to $\frac{1}{4}$ in. and set up as shown. With a properly ground drill, the hole in the end of the rod will be spotted on center.

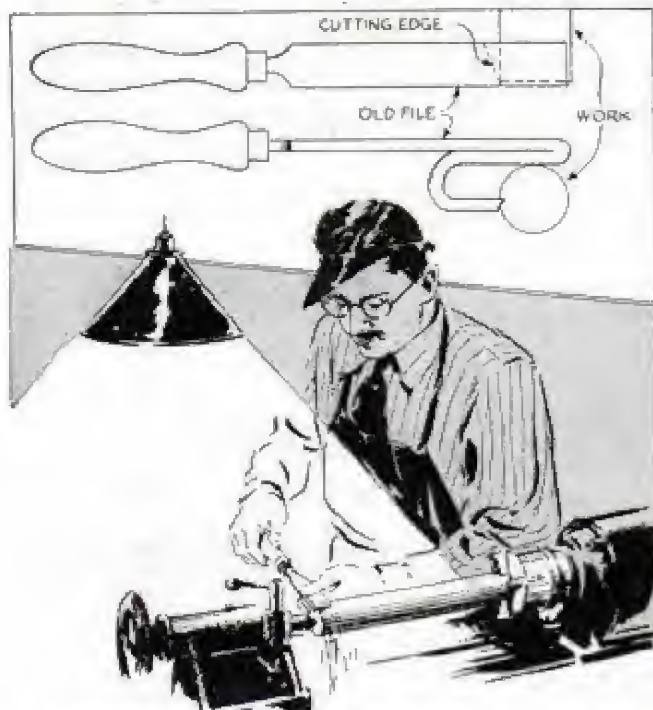
—R. F. Lindenmuth, Barnesville, Pa.



Wetting Plaster Crack to Patch It

Instead of wetting the edges of a plaster crack with a cloth, sponge or brush before patching it, use a small household insect sprayer. It concentrates the water where directed and tends to force it into the plaster, causing the patch to bond firmly with the wall.

Self-Supporting Chamfering Tool for Lathe Operators

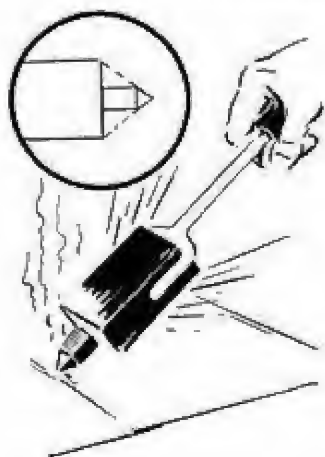


You'll find this easily made tool much faster for chamfering the edge of work than a file

Workmen who often use a file to chamfer the edges of work in a lathe, will find this tool a timesaver. It is made from an old file heated and bent to the shape shown. The tool is held on the work as indicated in the detail so that the sharpened end bears against the edge of the work.

—H. Moore, Hamilton, Ont., Can.

Small Soldering-Iron Tip Holds Heat



Here is a soldering-iron tip that can be used on delicate work with the added advantage of holding heat for a longer period than the usual light tip required for this work. To make the tip, take a large one that is old and pitted so that it is

unfit for further use and cut down the end with a saw or file to the shape indicated in the drawing. This gives you a small tip or working surface which can be used on del-

icate jobs, but is backed by a large piece to hold heat and transmit it to the tip.

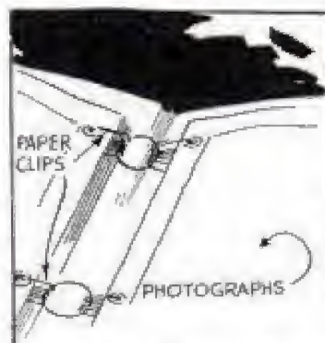
—Joseph Petr, Omaha, Nebr.

Fuller Ball Is Convenient Handle for Drawing Instruments

Drawing tools, especially compasses and dividers, may be made much more convenient for use if a fuller ball, about $\frac{1}{2}$ in. in diameter, is forced over the handle of each. This gives a large, non-slip grip.



Photos Held in Loose-Leaf Binder by Means of Paper Clips



When you want to keep photos filed in a loose-leaf binder, you can use paper clips, as shown, instead of punching holes in the photos. The required number of

clips are slipped over the rings and then over the photographs, thus holding them securely without marring the paper, and photos are easily removed or replaced.

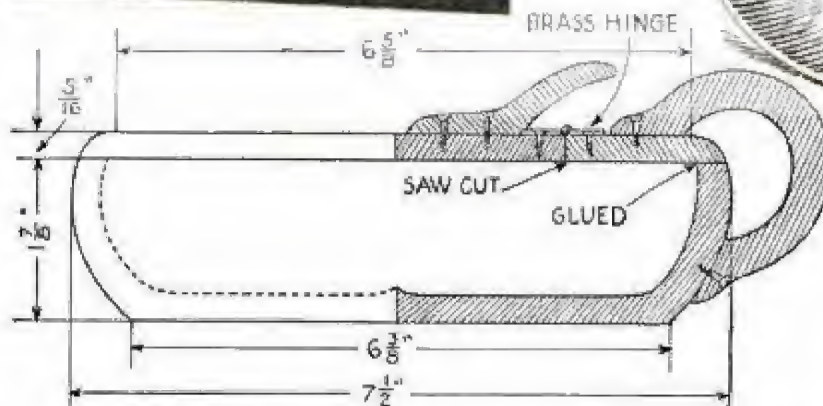
Rubber Hose Aids in Bending Copper Tubing

Small copper tubing, such as is commonly used for gas lines in automobiles, may be bent at almost any angle without kinking if a length of rubber hose is fitted rather



snugly on the tube to cover the portion to be bent. With the hose in position, the tube may be grasped with the hands, as indicated, and bent slowly without damage.

Turned Candy Box Has Hinged 'Snap-Up' Lid



There's one unusual detail in the turning of this attractive wooden candy box, that is, the lid and box proper are turned and finished as one piece. First, you turn and recess the box to near the finished dimensions, making the sides and bottom about $\frac{3}{8}$ in. thick. Then saw the lid slightly over size and locate the approximate point where it is to be cut to get the hinged section. Slip a piece of wax paper under

this latter portion and spread glue between the fixed section and the box. Clamp in the lathe until the glue is dry. Then set the work up on the band saw as shown and cut the hinged section of the lid free. Set it back in place with spacers the width of the saw cut between the two parts and re-mount in the lathe with a block of wood over the lid to prevent marring. True up with light finishing cuts. Then install the hinges, handle and "trigger." The latter parts are fitted to the contour of the box by removing waste with a rasp until the fit is uniform. Then they are attached with screws and a spot of glue.

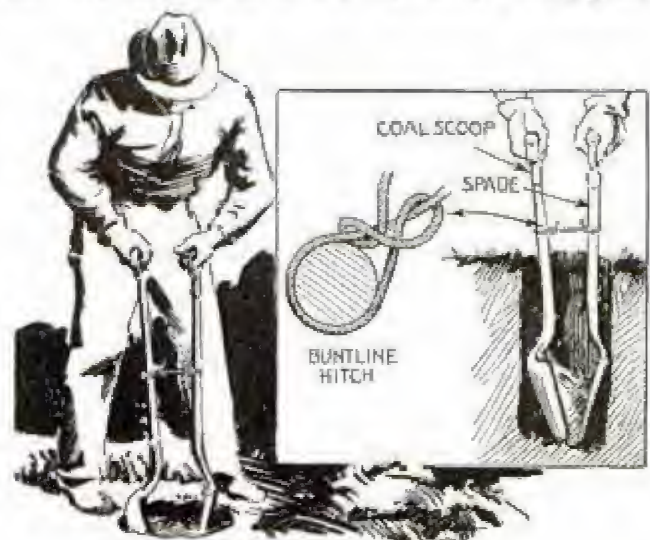
—Dale R. Van Horn, Lincoln, Nebr.

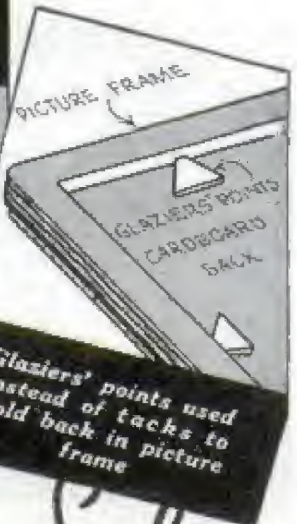
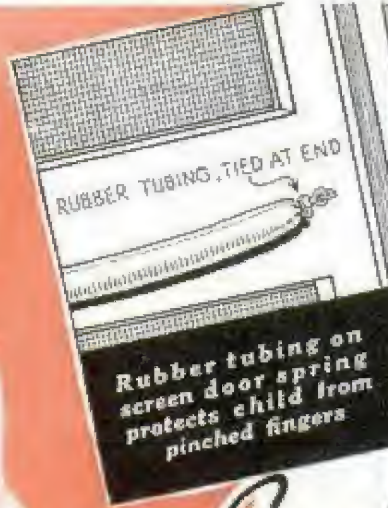
Shovel and Spade Tied Together to Make Post-Hole Digger

The town or city resident who occasionally wants to set a post and does not have a regular post-hole digger at hand, can improvise one from a spade and a coal scoop or shovel. These are tied together near the top of the handles, as shown in the detail. When connected together, the spade and shovel can be operated in much the same manner as a post-hole digger.

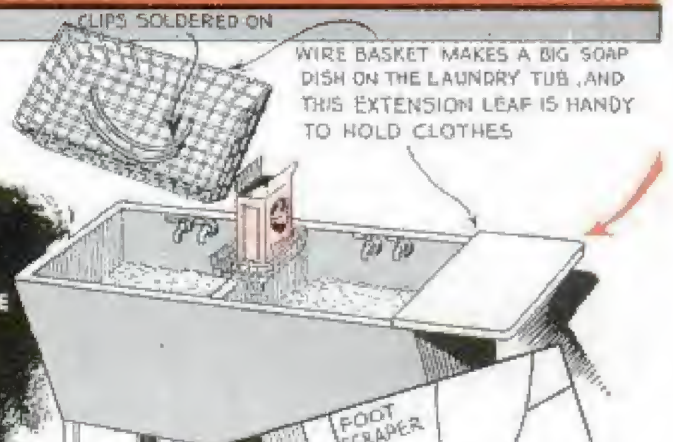
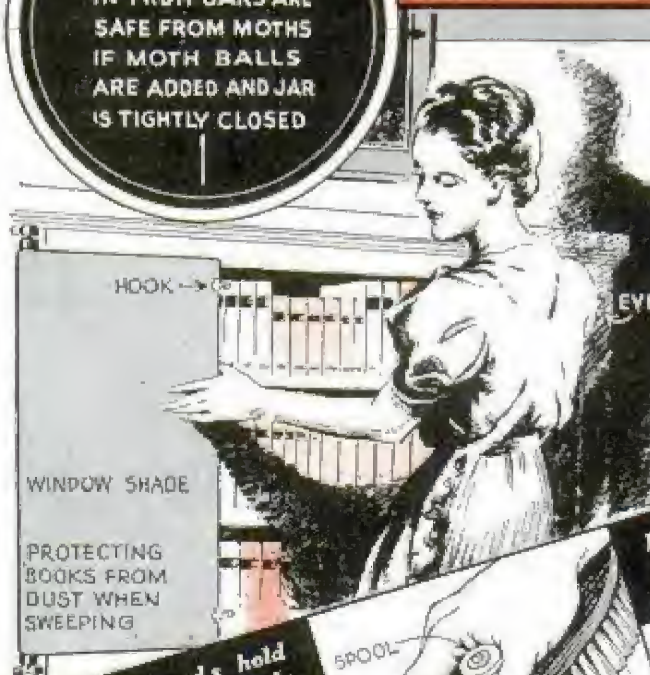
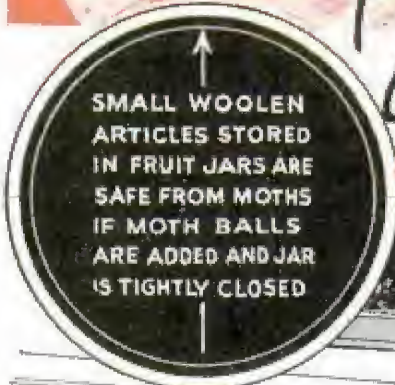
—W. Mack Angas, Winchester, Mass.

❑ To keep the inside surfaces of bread boxes and other tin containers from rusting, coat them with melted paraffin, especially the joints and cracks.

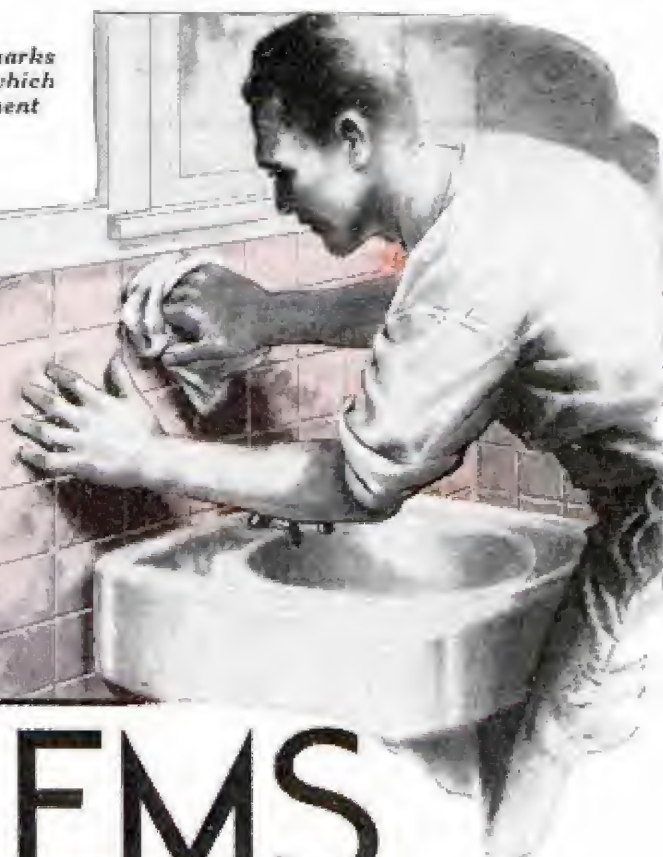
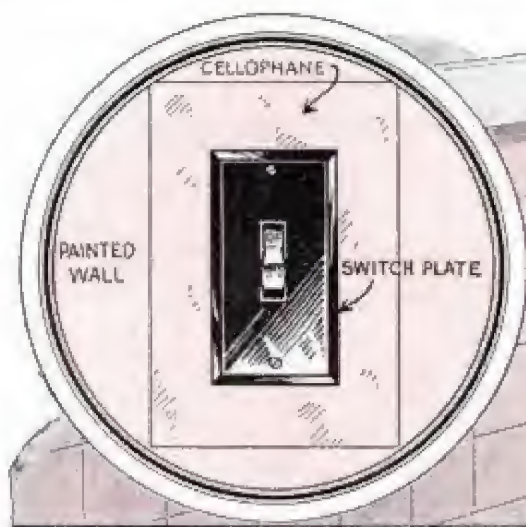




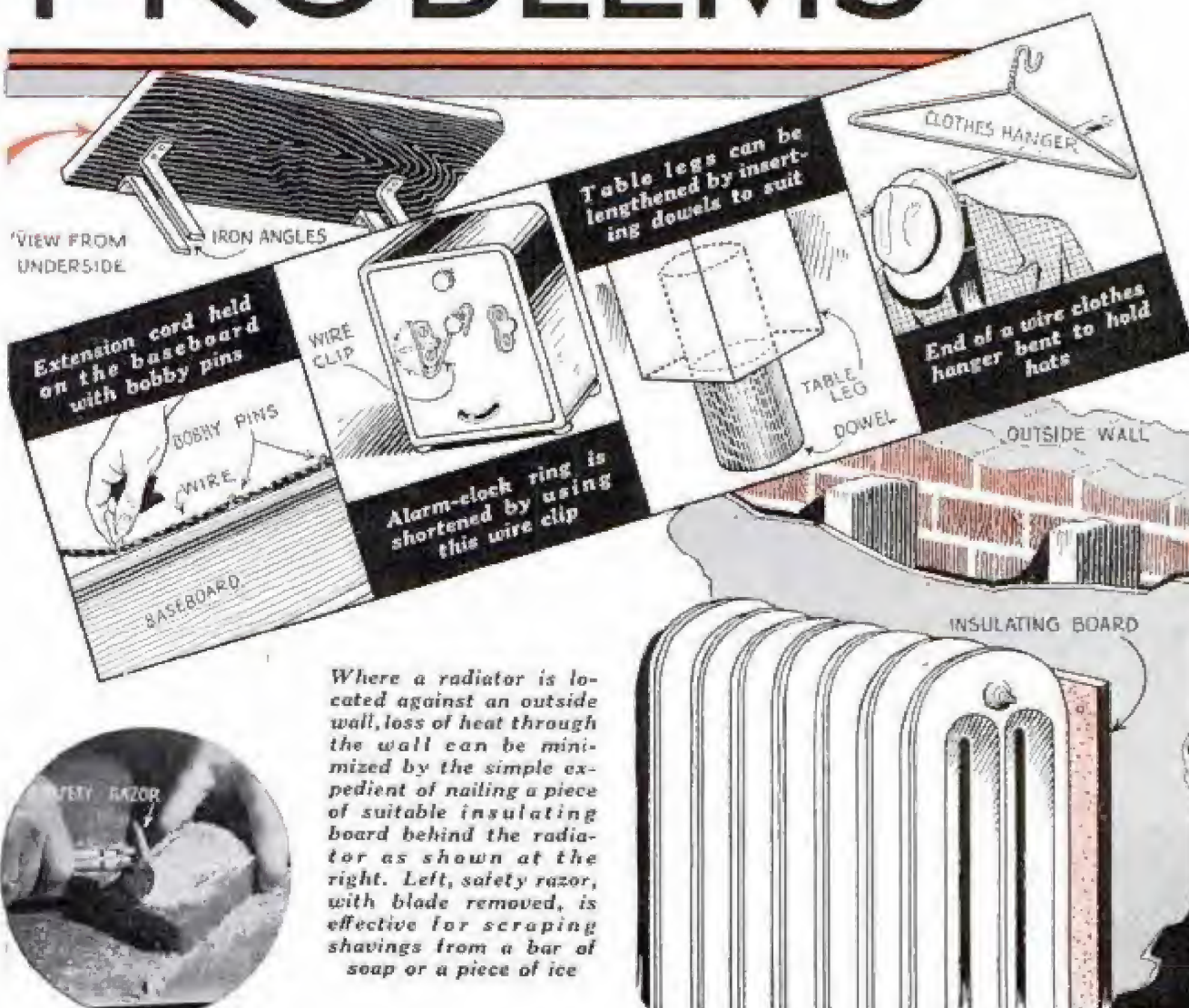
Easy Ways to Solve Your HOME



To protect wallpaper from being soiled by fingermarks or by splashing you can use sheets of Cellophane, which are glued to the wall by means of transparent cement

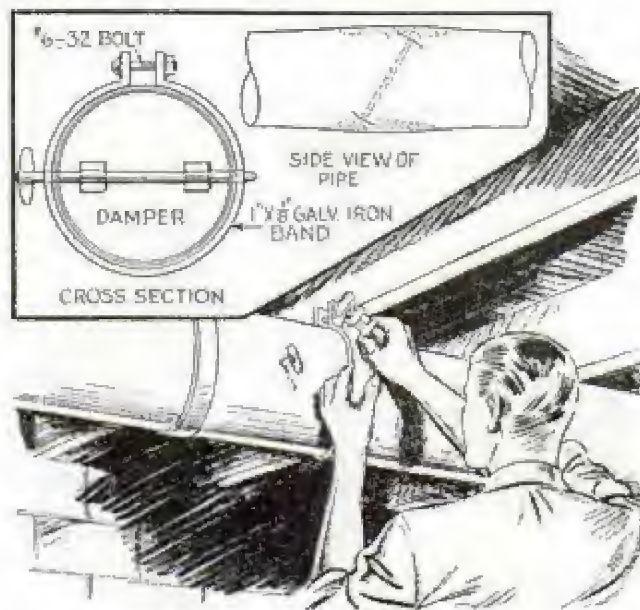


PROBLEMS



Where a radiator is located against an outside wall, loss of heat through the wall can be minimized by the simple expedient of nailing a piece of suitable insulating board behind the radiator as shown at the right. Left, safety razor, with blade removed, is effective for scraping shavings from a bar of soap or a piece of ice

Bent Smoke Pipe Is Trued Up with Adjustable Iron Bands



Bringing bent smoke pipe to its original contour by clamping it tightly with metal bands

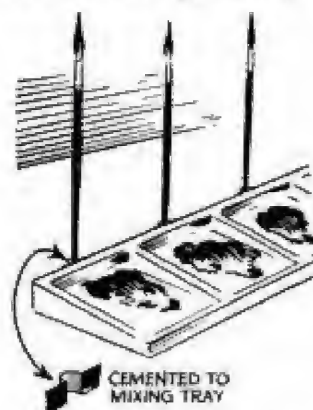
If you have installed a damper in a smoke pipe and have bent it out of shape slightly in doing the job, the pipe can be brought back to its original contour by

clamping iron bands around it as indicated. The bands are cut from heavy sheet metal and are drilled and bent at right angles at the ends to take bolts with which they are turned up snugly around the pipe.

—L. H. Georger, Buffalo, N. Y.

Brush Holders on Mixing Tray

Instead of using one brush when retouching photos, which often calls for various tints and necessitates washing the brush several times, one artist attached a brush holder to the back of each section of the mixing



ing tray so that he could use a brush for each tint. The holders are small brackets bent from thin sheet metal to the shape shown. This arrangement allows the artist to work fast and with positive assurance that he will have the exact tints each time.

Venetian Blinds to Dress Up Your Windows



Tilted slats let in air and light without glare. Quickly adjusted at any desired angle for shade on sunny days or privacy at night. Our blueprints 926 and 927 cover the construction of three different types of Venetian blinds and will be sent postpaid upon receipt of a 50c remittance.

BLUEPRINTS ON WINTER SPORTCRAFT

18-FT. ICE BOAT—774: Roomy cockpit seats four people. 14-ft. mast, main sail and jib. 25c.

FRONT STEERING ICE BOAT—786: 13-ft. cockpit. Single sail on 18-ft. mast. Safe. 25c.

COASTING TOBOGGAN—657: 7½ ft. long by 16 in. wide. Includes data on bending slats. 25c.

8-FT. BOBSLED—632: Auto-type steering gear. Runner supports made from pipe fittings. 25c.

HOMEMADE SNOWSHOES—796 and 797: Prints show how to bend frames, and string rawhide. Two prints 50c.

AIR-PROPELLED ICE BOAT—785: Motorcycle engine drives a 52-in. airplane propeller. Has canvas-covered fuselage 8 ft. long. 25c.

Any six of these blueprints will be sent postpaid upon receipt of \$1.00

Blueprint Department, Popular Mechanics Magazine, 200 E. Ontario St., Chicago



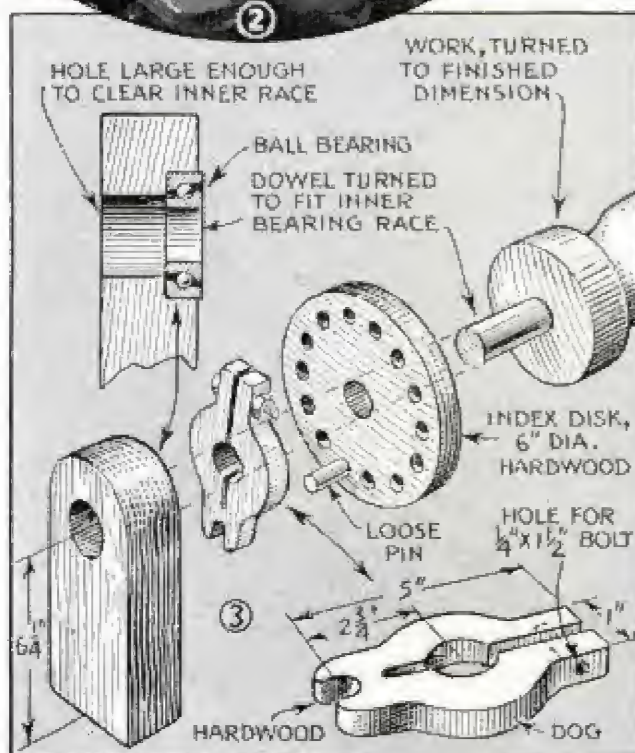
Accurate SPIRAL FLUTING with this homemade jig

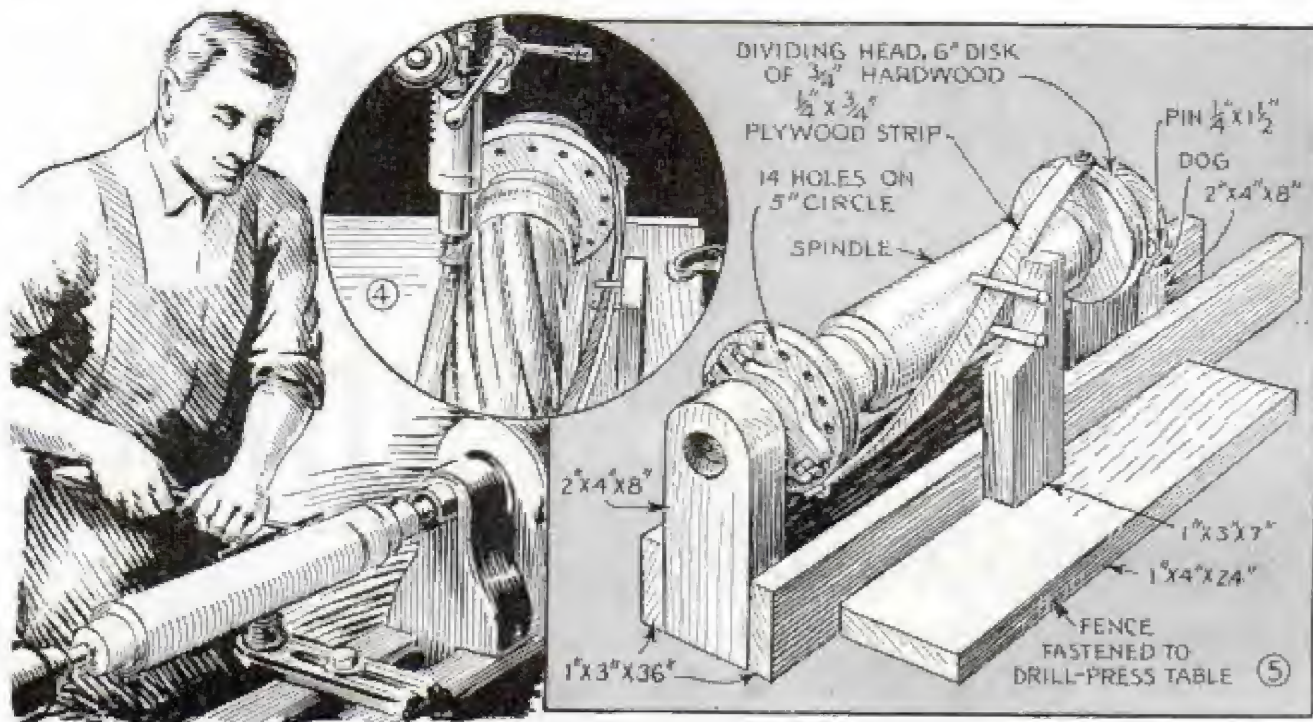


By EDWIN M. LOVE

USUALLY spiral reeding and fluting on a turned column means a tedious job of hand carving. However, if you take time out to build this simple jig, your shaper, drill press or lathe will do the hard work, and the variety of patterns will depend only on the assortment of shaper cutters at hand. Once set up, it takes but a few minutes to do the most intricate job, for the jig mounts the column on bearings and rotates it against the cutters as the assembly is pushed along the fence.

The ends of the jig are cut from scraps of 2 by 4-in. stock. Two ball bearings are obtained, not less than $\frac{3}{4}$ in. in diameter, and preferably larger. These are mortised into the jig ends by counterboring with an expansive bit as in Fig. 3, the smaller hole being large enough to clear the inner ball races. Side pieces are 36 in. long, to accommodate a 30-in. spindle. One bearing end is nailed rigidly in place, the other being screwed or nailed where needed when a column is mounted. Equidistant holes are drilled near the circumference of the index disks, the number being a matter of





choice, although seven, or some multiple of seven, is usually sufficient for average work. Each hole is numbered with a lead pencil. The work is turned with dowels on both ends long enough to take the index disks, dogs and washers, leaving about $\frac{3}{4}$ in. to enter the bearings, Figs. 3 and 5. The spindle is mounted in the jig with an index disk, dog and washer on each end. For the spiral guide, a strip of plywood cut with the outer plies running crosswise is used. The ends are screwed to the disks as in Fig. 5. After one end has been fastened, the index pins are inserted in the holes numbered 1 to lock the disks. Then the guide strip is flexed to the desired spiral and the free end fastened to the second disk. The fence has an upright notched into one edge, Fig. 5, the latter being pieced out if necessary with a $\frac{3}{4}$ -in. strip, so that the upright will clear the spiral guide. For the upper pin use a $\frac{1}{4}$ -in. dowel; for the lower, a headless nail, bearing lightly against the guide strip.

When setting up the jig on a drill press, depth-stop parts are removed from the machine, the cutters put on and the table tilted to the angle of the spiral by resting the jig on the table and shifting it until the spiral appears to be level alongside the cutter. Then the jig is placed in cutting position and the fence clamped against it. After checking for easy movement, the jig is shifted until the cutter clears at the starting end. Then the machine is started

and the jig pushed slowly forward against the fence and table, Fig. 2. When the cut is finished the jig is removed, the index pins withdrawn and the disks shifted to holes numbered 3, and the process repeated until all seven cuts are made. If intermediate spirals of different pattern are desired, the shaper cutters are changed and the index pins inserted in the even-numbered holes as in Fig. 4.

The jig is used on a spindle shaper by laying it on its side, suitably blocked up from the table, and running the bottom against a fence, the cutters working at the top of the jig. Here the guide pins are mounted on the shaper table. A similar arrangement is used on a lathe, the cutter working on the upper side. When designing the column to be fluted, leave coves or small-diameter cylindrical sections at the starting end, Fig. 1, to clear the cutters. Tapered columns are fluted by using a dividing disk at the small end proportionally smaller than that at the larger end.

Correcting Balky Electric Clocks

If your electric clock has the motor sealed in a case packed with lubricant, and it suddenly stops, the trouble is often caused by the lubricant settling to the bottom. This can be corrected usually by turning the clock upside down for a few days, in which time the lubricant will redistribute itself.

"Sewer Mole" Does the Work of Many Men



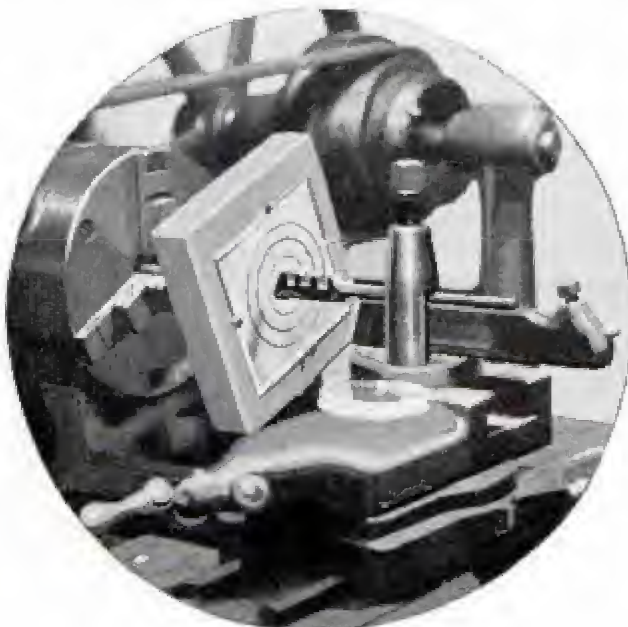
For cleaning out clogged drains and sewers at greatly reduced labor cost, an electric "sewer mole" was recently put in operation by a California contractor. Consisting of a powerful electric motor mounted on a movable carriage with several feet of flexible metal tubing inclosing the power drive wire, and the working unit at the end of the tubing, the machine is a compact laborsaving aid to cities and property

owners. The "teeth" are two sharp, adjustable steel blades, which rotate faster than the eye can follow. "Boring" into the sewer or pipe, they reduce any hard-packed mass of rubbish to loose material that can be flushed out with a hose. Only two men are required to use the machine, which can be operated several hundred feet from the obstruction in the pipe.

—Bob McLean, Oakland, Calif.

Glass Cutter Held in Lathe Tool Post Scores Any Size Disk

Those who have a lathe may use it for cutting glass disks if they have no circle cutter at hand. A block of wood is chucked in the lathe headstock and is faced up



square, after which a piece of glass slightly larger than the disk required is fastened to the block by means of carpet tacks. Three of the tacks are driven into the block so that their heads just clear the thickness of the glass, while the fourth is pressed in with the fingers. This facilitates changing pieces of glass of identical size if you wish to cut a number of disks, as only the fourth tack has to be removed and replaced. Penciled circles may be scribed on the wood block for convenience in locating the glass cutter. This is gripped in the tool post and is lightly pressed against the glass, the chuck being rotated by hand. After the circle has been scored, the glass is removed from the block and several radial scores are made from the circle to the edge of the glass. This facilitates the removal of the disk from the square with little risk of breaking it when tapping the glass on the reverse side.

—J. L. Phelps, Lincoln, Nebr.

Stove-Wood Ricks Held Together by Woven Wire

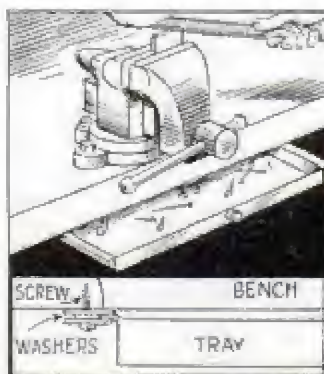


Why have your ricked stove wood scatter when strips of woven wire will prevent the trouble?

When you rick up your stove wood or kindling, it's a good idea to lay strips of woven wire on the rick as you pile it so that the wood will not roll down as it is used. Place the strips of wire about 1 ft. apart. Any scrap or old rusty wire that you have lying around will do the trick.

Sliding Tray Under Bench Vise Catches Small Parts

Workmen and shop mechanics will find that a sliding tray underneath their vise is handy for catching small parts, which often fall to the floor when dismantling or assembling various kinds of work. The tray is a shallow sheet-metal pan with flanges projecting at right angles from the sides to slide in improvised grooves un-



derneath the bench top. These grooves are made by screwing two strips of thin flat iron to the bench with washer spacers between them, as shown in the detail.

—Chas. H. Willey, Concord, N. H.

Novel Store-Window Caricatures from Merchant's Wares

Last season these clever little caricatures made from stock taken right off the merchant's shelves, proved highly effective in getting the attention of the holiday shoppers. Little Miss Muffet in Fig. 1, frightened by a large spider, makes an outstanding display with her cauliflower body, grapefruit head, and eyes of potato slices dotted with pea pupils. Carrot legs, and asparagus-stalk arms with a tomato spider pierced with green-bean legs complete the picture. Associated with Miss Muffet is jolly Santa, Fig. 4, directing attention to holiday foods. The Santa has a cheese face dotted with onion eyes having olive pupils, red-tomato cheeks, a parsnip nose and split-pea pod mouth surrounded by a mustache of peeled bananas and a cooked spaghetti beard. Carrots form fingers which hold a spoon. Santa threading a needle, in Fig. 5, centers interest on fancy work in a notions store. Buttons form amusing eyes, which are mounted on a cardboard face covered with silk. Silk-thread skeins serve as eyebrows and mustache. Wool yarn wound around a cardboard cutout comprises the beard and the hands are cut from heavy felt. Strips of felt and fabric form the cap. The robot tennis match in Fig. 2 is the subject of an interesting display for hardware stores. Tea balls serve as the players' heads. The figure at the left consists of a potato masher, funnel, small cake pan, measuring spoons and a smaller funnel all held together with toothpicks and bits of adhesive tape. A potato masher, tube, spoon and a percolator cup comprise the other player. In Fig. 3, style comes to the kitchen in a novel utensil display. An inverted coffee pot, resting on a percolator stem, forms the head, with a twisted door spring serving as a coiffure. A pan cover with a cookie mold and an egg beater perched at a jaunty angle, form the bonnet. Numerous other figures can be assembled in the same way.



Eye-stopping

WINDOW DISPLAYS



These suggestions closely tie up your merchandise with the display as all the figures are assembled from materials on your shelves. Figs. 1 and 4 are suggestive of fresh vegetables for the holiday season, while Santa in Fig. 5 reminds the shopper of yarns and fabrics for Christmas gifts. The robot tennis game in Fig. 2 and the stylish bonnet in Fig. 3 are appropriate for the hardware store, suggesting kitchen gifts and cooking utensils for the holidays



Color Chart in Millinery Store Helps Customer Select Hat



Changeable color-chart support close to lady's hat enables her quickly to select color of new hat desired

Instead of having a customer try on several hats of different colors, the saleslady in a millinery store uses this color chart which enables a customer quickly to pick out a color to harmonize with the rest of her garments. The chart consists of a wire holder soldered or bolted to an adjustable standard, such as a music rack, and several pieces of cardboard of different colors which can be slipped in and out of the wire holder. In use, the standard is placed close to the customer as she looks into a mirror and the cards inserted until the color desired is found.

Machinists' Goggles Easy to Clean with Wash-Basin Stopper



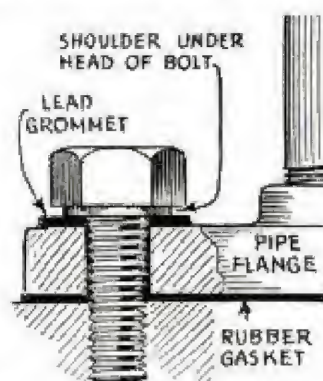
Those who have occasion to wear safety goggles at work, will find that a piece of cloth wrapped around a wash-basin stopper is ideal for cleaning the lens on the inside. When the metal ring is removed from the stopper, the boss projecting from its upper surface makes a handy finger grip for holding both the stopper and the cloth,

and the smooth bottom surface provides a good resilient backing for the cloth. The stopper allows a firm twisting motion which thoroughly cleans and polishes both inside and outside the lens.

—Frank Bentley, Clinton, Iowa.

Bolt Heads Flanged to Prevent Splitting Lead Grommets

When a job requires using lead grommets under bolt heads, they are likely to be split by the sharp edges of the head when tightened down on them, unless some precaution is taken to avoid this trouble. A good precaution is to turn a small shoulder on the underside of the bolt head, as shown in the drawing. It takes only a few minutes to do this, and is well worth the time required, especially when lead grommets are used only occasionally on certain jobs.



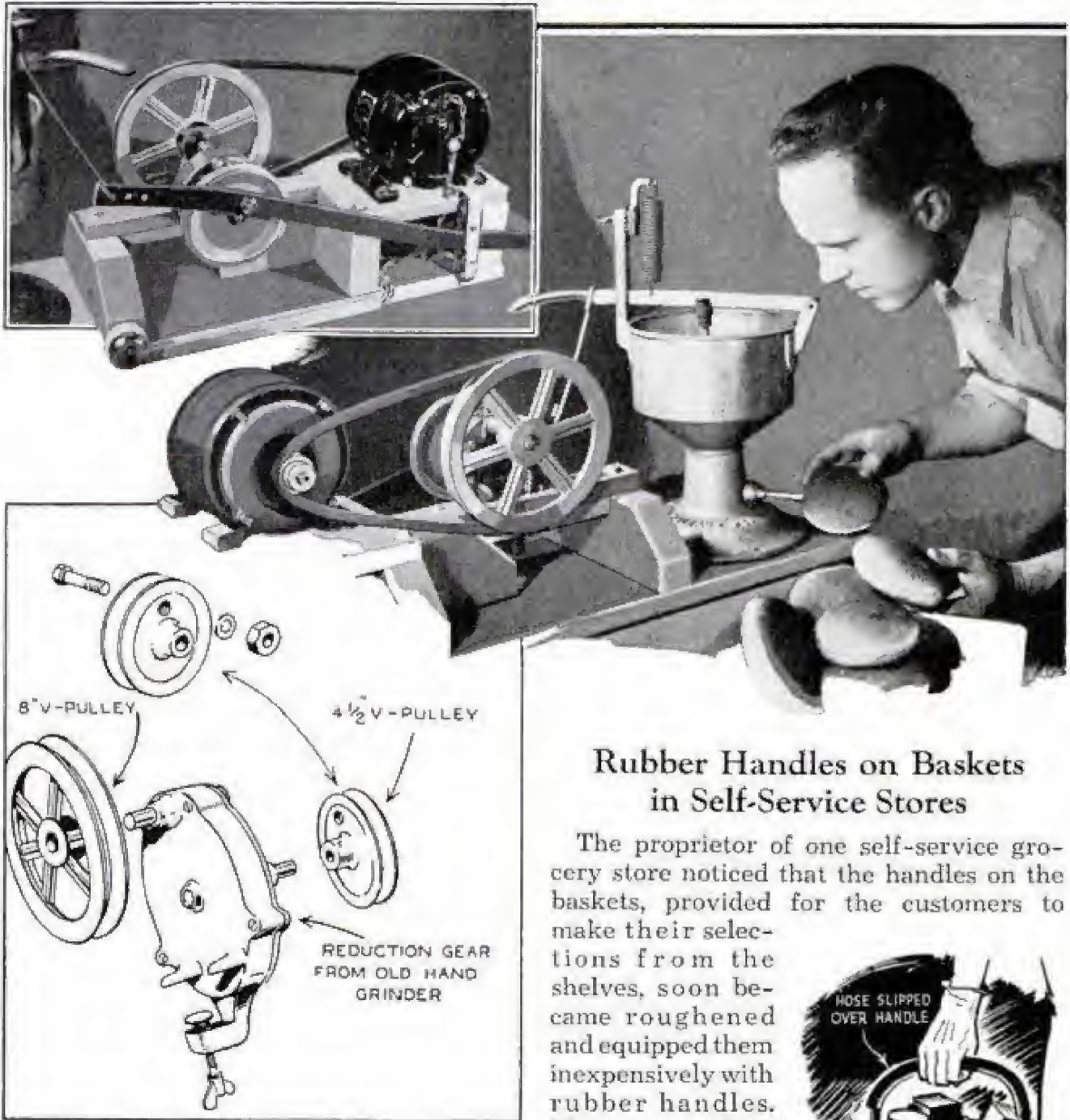
Clothespins Hold Window Cards

By whittling off the inside surfaces of the jaws of spring-type clothespins, as indicated by the dotted lines in the detail, so that the other ends form a wide angle, you can make inexpensive supports for window display cards. The spring in the clothespins is strong enough to allow the wood to be cut away from the edges to increase the spread of the other ends more than 1 in. and still retain a good grip on the cards. When painted a bright color, the pins are attractive and can be snapped on or off in a jiffy.



Castings will part easily from plaster molds if the latter have been smoked by holding them over a lump of burning rosin.

Baker Motorizes Hand Pastry-Filling Pump



Here's a simple method used by one baker to convert his hand-operated jelly pump to a power-driven outfit, which he claims works fast and uniformly in filling bismarcks, eclairs, etc. Speed reduction is obtained by using a hand grinder, V-pulleys being substituted for the handle and grinding wheel. The pulley on the handle shaft is fitted with a crankpin, which actuates an arm to operate the pump handle, the latter being connected by a heavy wire link. The other end of the arm is attached to the base of the outfit by means of a bracket through which it slides freely.

Rubber Handles on Baskets in Self-Service Stores

The proprietor of one self-service grocery store noticed that the handles on the baskets, provided for the customers to make their selections from the shelves, soon became roughened and equipped them inexpensively with rubber handles. These are nothing more than short lengths of large-size garden hose, and were installed by removing the rivets from one side of the handle, slipping the hose in place and then replacing the rivets. Besides providing a smooth surface for the hands, the hose was found to be more sanitary than wood as the smooth surface is cleaned easily at intervals with a coarsely woven cloth and warm, soapy water.



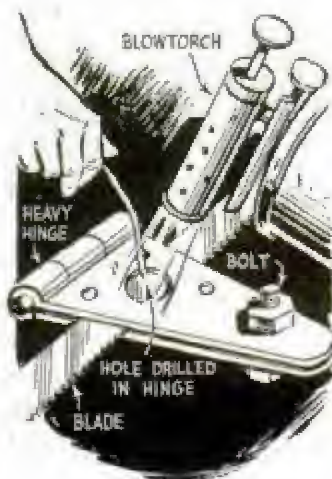
Baggage Counter Has Rollers to Slide Suitcases Easily



This baggage clerk rolls suitcases across the counter with little effort

To ease his job of sliding heavy suitcases and packages over the counter of a check room, one clerk fitted a number of rollers into the counter, as indicated. These were made by centering iron rods in lengths of pipe and then filling them with cement, the rods projecting slightly from the ends to fit in iron sockets screwed to the ends of the roller slots cut in the counter. The rollers should be staggered so the baggage rests on one or more rollers at all times.

Clamp Grips Band-Saw Blade While Brazing It



In one small shop where broken band-saw blades were brazed frequently, a workman made a clamp from a hinge to hold the broken ends of the blades together. The clamp consists of an ordinary strap hinge in which a large opening is

drilled to expose the ends of the blade to the torch flame. In use, the ends of the blade are butted together in alignment under the opening, after which a bolt through one of the screw holes in the hinge is tightened to hold the blade securely.

Small Clay Flowerpots in Molds Form Smooth Pouring Holes

In a foundry specializing in small brass and aluminum castings, clay flowerpots about 2 in. in diameter were found to provide good pouring holes in the molds. The bottoms are knocked out of the pots, which are then set in the sand as indicated. The pots also provide a hard lining that the metal will not cut or wash away as it does sand.



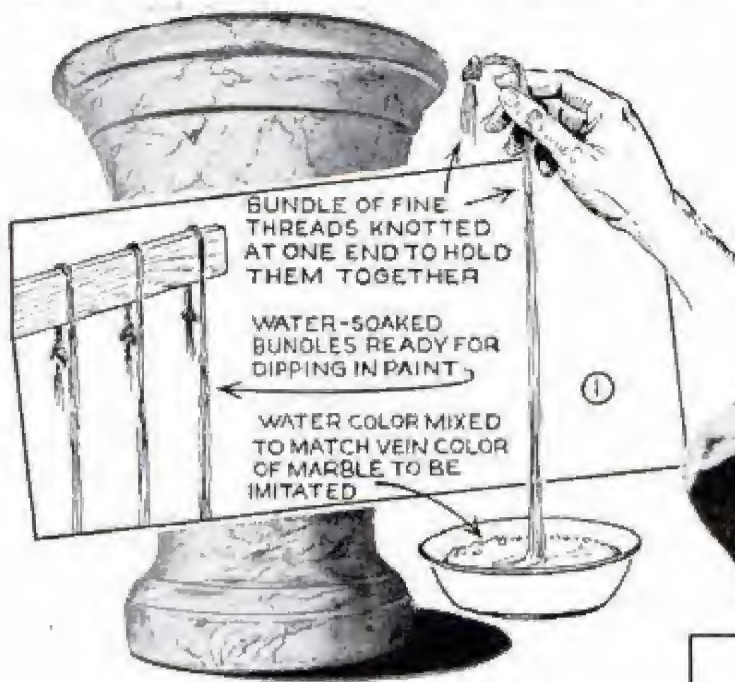
Chairs in Shoe-Shining Parlor Have Magazine Racks

To provide his customers with reading matter while having their shoes shined, the owner of one shoe-shining parlor fitted the chairs with magazine racks. These were made of thin plywood, painted and then screwed to the legs of the chairs.

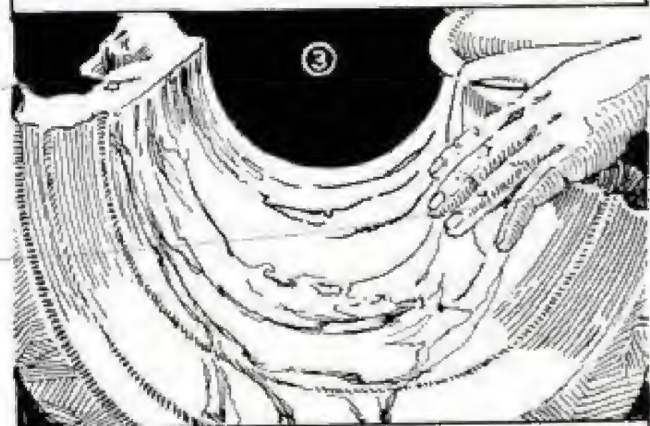


Magazine racks on chairs of shoe-shining parlor keep reading matter at hand for waiting customers

IMITATION MARBLE



After webs are dipped in colors the bundles are spread and arranged in the greased mold



"Scag" layer is built up by sprinkling thin layers of dry and wet aggregate over webs



Before the aggregate sets, the webs are lifted out of the molds

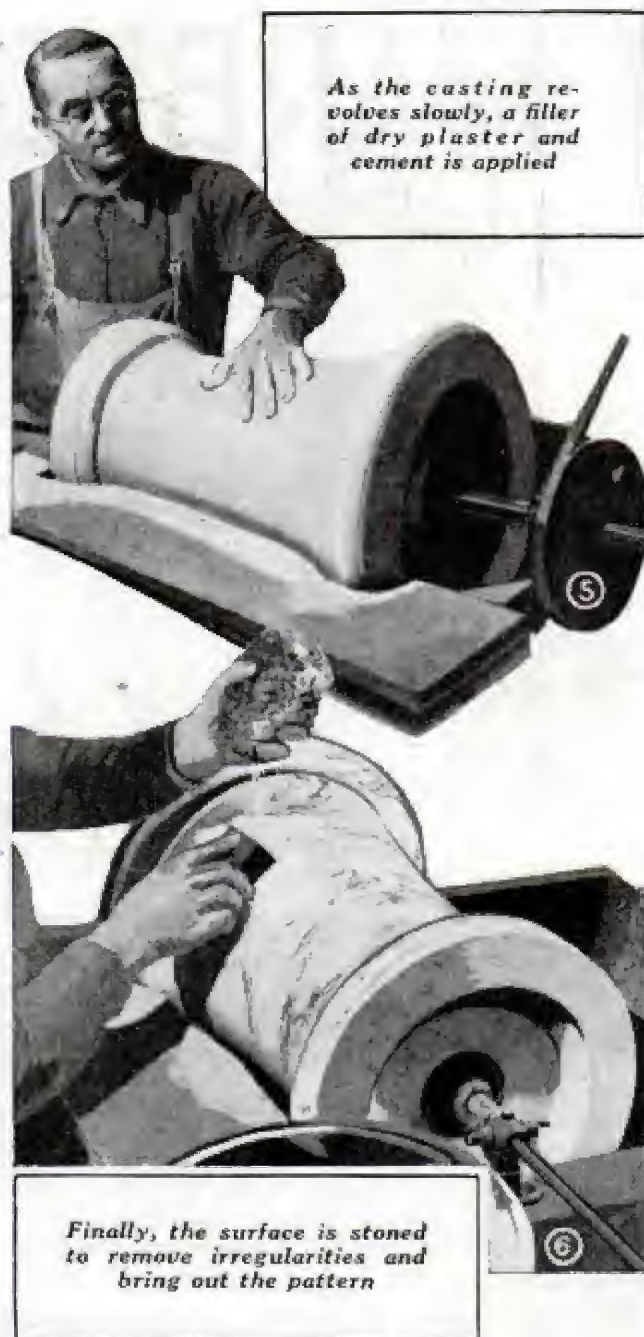
By J. MODROCH

Conn. R. F. L. 2, Hantbury

"SCAG" is the shop term usually applied to imitation marble cast by this process. The trick is simple once you have seen it done. Webs of extra-fine silk thread saturated with water color serve as a vein pattern. Superfine plaster-cement, which sets with a smooth, hard, glassy surface is used as the casting aggregate. Veins are embedded in the cast by laying paint-soaked webs in empty mold sections, Figs. 1 and 2, covering them with a thin layer of aggregate and then lifting them out as in Figs. 3 and 4. Thus, color patterns of the webs are left imprinted in what becomes the surface layer of the finished casting, since the inner bulk of the aggregate is not poured into the mold until after the "scagging" operation has been completed. The result, when polished and waxed, is a realistic likeness of marble that even an expert might not detect as being imitation.

In preparing webs, the threads are divided into bundles, about the diameter of a pencil, and each is knotted at one end, Fig. 1. After cutting to convenient lengths, the latter depending on the size of the job, bundles are thoroughly soaked in water before being dipped in the paint. Dark-blue water color was used in casting the

260 W. Broadway New York
 Coney Island
 W. H. H. 2, Hantbury
 cement - imported by



vase shown. Many kinds of marble can be imitated since it is only a matter of mixing paint to match the color of the original.

Spreading paint-soaked bundles requires four hands. The bundles are simply pulled apart, allowing the threads to separate and clot however they will. The webs thus made are then laid in greased mold sections, Fig. 2, being placed so that they overlap slightly where more than one web is required to cover the mold completely.

The scag layer is built up by sprinkling succeeding thin blankets of dry and wet aggregate over the webs, Fig. 3, until the layer not only covers threads but also reaches a sufficient depth to allow for stoning down later on. Fig. 4 shows the

web being lifted out, which completes the scagging operation. However, as further protection against disturbing delicate veins of embedded color, additional layers of aggregate are carefully troweled on over the scag layer before the mold is assembled and the rest of the aggregate poured.

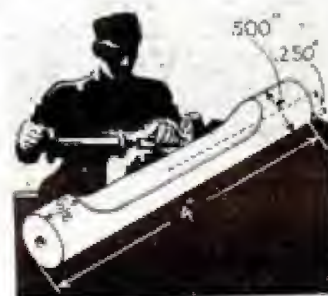
After castings have been removed from the mold, mold seams and other irregularities are leveled off with a medium-surfaced water stone and a filler of dry plaster-cement is applied with the hands, Fig. 5. Allowing time for the filler to set, the surfaces are polished with a fine-surfaced stone, Fig. 6, then washed with water and given a final finish of wax.

Dead-Center Gauge for Cutting Accurate Threads

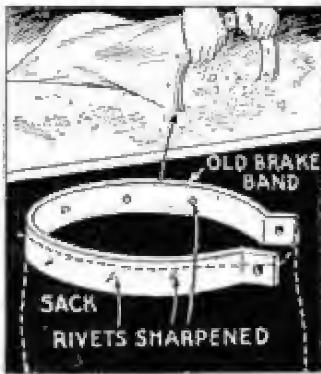
On thread-chasing jobs where accuracy in centering a threading tool is very important I use the gauge shown. To make, use a good grade of steel or machine-steel deeply case-hardened. First turn it to within .020 in. of the diameters given after squaring the ends, and milling the flat, bearing in mind that you must leave enough for grinding, as stock must be removed from two sides when the .250-in. dimension is considered. After hardening, lap the two centers and rough grind to .5005 in. This one-half thousandth allows for lapping. Then grind on centers to .25075 in. on the flat, which allows .00025 or $2\frac{1}{2}$ tenths for lapping the flat. When lapping to

.500 diameter use a lap that is at least 3 in. long to take care of the open part of the gauge. The flat part of the latter is lapped last. To use the gauge, set it between the lathe centers with enough tension to permit it to be turned with the fingers. Set your threading tool as near dead center as you can see with your eye and move the threading tool to the center of the gauge. You can rock the gauge against the threading tool point if it is below dead center. If it is above, you will not be able to get the tool point on the flat of the gauge.

—James MacIntyre, Hartford, Conn.



Spring Band Holds Sack Open



Made from an old auto brake band of the external type, this simple device will be found useful for holding open the mouths of sacks and bags. It is especially handy when removing

the contents from a bag or when using it to dip up material from a pile. Pointed prongs to puncture the upper edges of the sack are made by inserting rivets through holes in the band and pointing the projecting ends with a file.

Tool Chest Serves as Light Bench on Outside Jobs

To avoid stooping to get tools from a chest, and to provide a handy little bench for light assembly work, a plumber mounts his chest on detachable pipe legs. Floor



Plumbers and others will find this tool-chest bench handy on jobs away from the shop

flanges are screwed to the bottom corners of the chest to take the legs. Long threads on the legs allow for adjustment to level the bench on uneven floors.

¶For mailing film packs of certain sizes, you will find a flat cigarette tin satisfactory.

Customers Can Test New Shoes on Improvised Walk



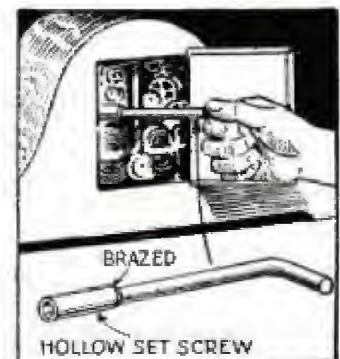
Customer tests new shoes under regular walking conditions with this novel platform

Simulating almost any walking conditions the wearer may encounter, this test walk in a shoe store enables a customer to test out a new pair of shoes before leaving the store. The walk consists of a narrow platform about 1 ft. high in the center with both sides sloping to the floor as indicated. The top surfaces of the walk are covered with rubber mats to prevent slipping.

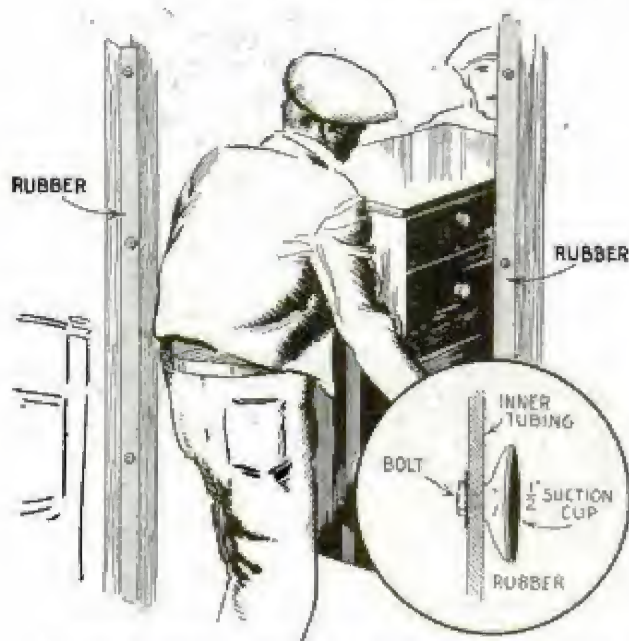
Tiny Socket Wrenches Are Made from Set Screws

Needing some socket wrenches smaller than could be obtained from the usual sources, I made up a set from hollow-head set screws, which are often used for fastening collars or pulleys to rotating shafts. The wrenches are made by merely brazing the set screws to handles shaped from small drill rod, and have been found ideal for work on radios, electric meters, clocks, and other small work.

—J. R. Coursey, Dallas, Tex.



Movers Use Rubber "Bumpers" to Protect Door Casings



Strips of heavy rubber on door casing prevent woodwork from being marred

To avoid marring woodwork in a house when carrying out furniture, one moving man uses heavy rubber strips which he fastens to the edges of the door casings with suction cups. These are the type that come fitted with small anchoring bolts, the latter being inserted through holes made in the rubber and the nuts covered with layers of electricians' rubber tape. When the workmen go into a home, it takes only a minute to install the rubber "bumpers."

—Earl Wellersdick, Torrington, Conn.

Spiral Iron Stakes to Hold Concrete Forms



in a vise and twisted, about three turns being made in each running foot of metal. When

In setting up his concrete forms on the ground, one contractor uses twisted iron stakes, which he claims are easier to drive and will hold better than straight ones. They are made from heavy flat iron which is heated, clamped in a

taking up the forms, the stakes are removed by merely screwing them out of the ground with a long-handled wrench.

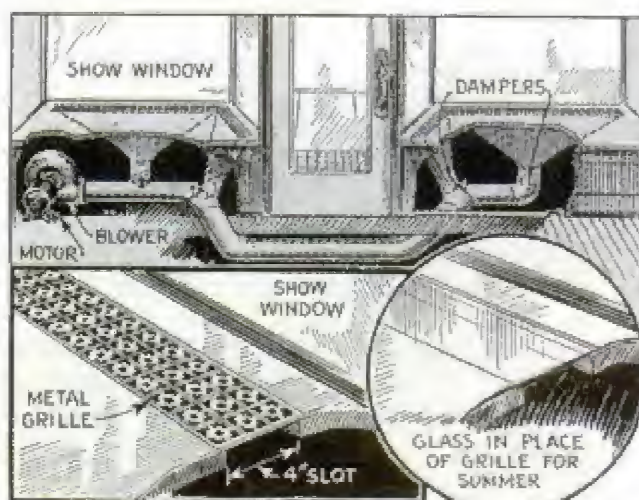
Oil-Soaked Bricks Make Fuel for Heating Sand

Instead of using coal or wood to heat sand and other materials on a construction job during cold weather, one foreman substituted oil-soaked bricks. These burn steadily for some time, require no poking or other attention to keep them burning, and there are no ashes to accumulate and clog the draft. A number of the bricks may be kept in a pail of oil drained from auto crankcases.



Dampness under Show Window Avoided with Blower

The problem of keeping the area under a show window dry during summer and preventing condensation on the glass during winter is solved with the simple installation shown. This consists of a small motor-driven blower which forces air through 4-in. slots along the edge of the window to prevent condensation. The slots are covered with a metal grille so that air from the blower can pass through them. During summer the slots are covered with pieces of glass to admit sunlight.



Glass-covered slots let sun dry out area under show window in summer and emit air from blower in winter

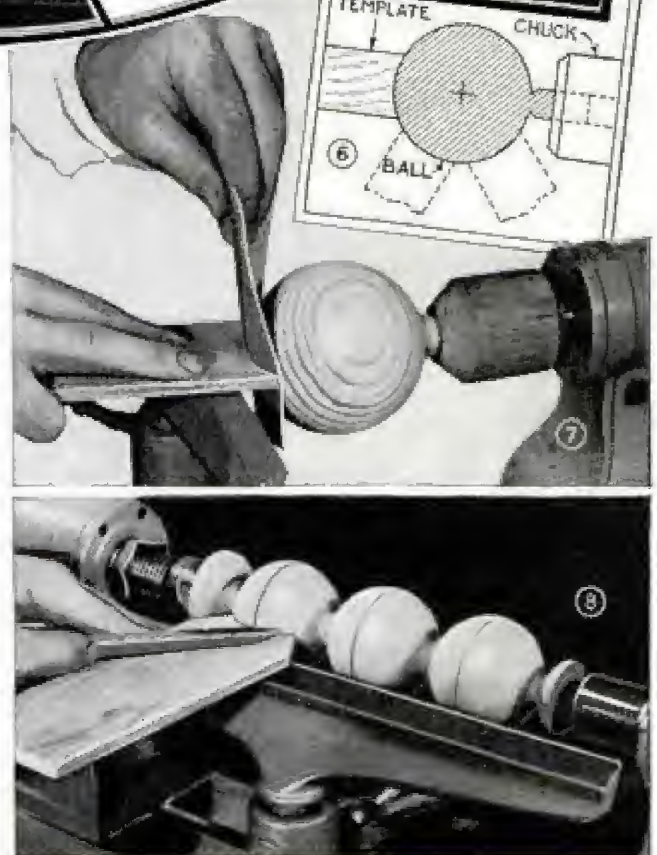
Turn Right!

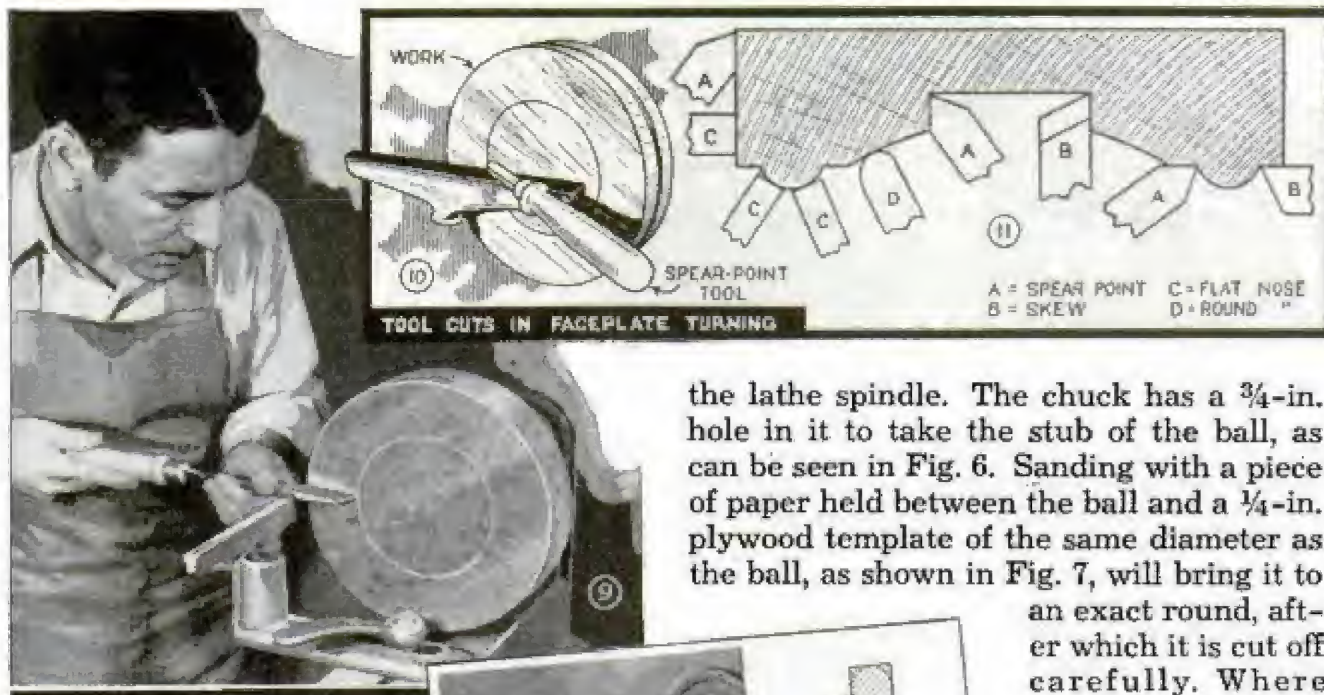
PART 2

FACEPLATE and CHUCK TURNING



AS ALL lathe work cannot be turned between centers, but must be mounted on a faceplate or chuck, the correct method of working is far more important than skill in the handling of the turning tools. The turning of a ball is a typical example. Where the ball is over 2 in. in diameter, the method shown in Figs. 1 to 7 inclusive should be used. Stock for the job is first squared up, and is then marked on two adjacent sides with a circle slightly larger than the size of the required ball. The shape thus marked is cut out on a band saw, the pieces from the first cut being bradded back in position to permit making the second cut. The resulting shape is roughly blackened with a soft pencil along the center area of each of the four sides, after which the work is mounted in the lathe between centers. Using first a gouge and then a skew, the wood is turned down until the pencil mark shows as a





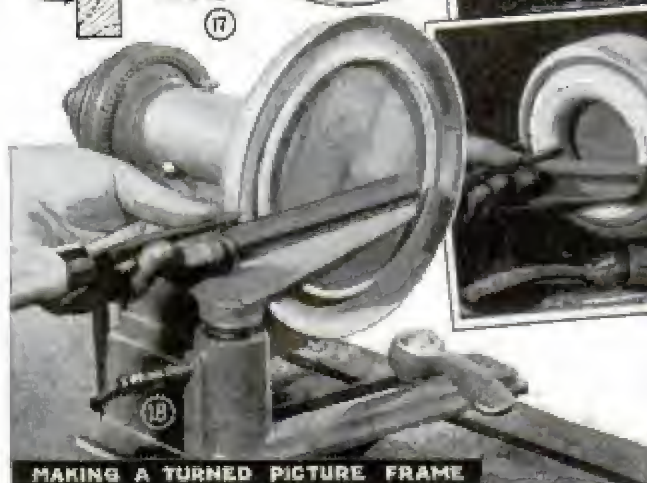
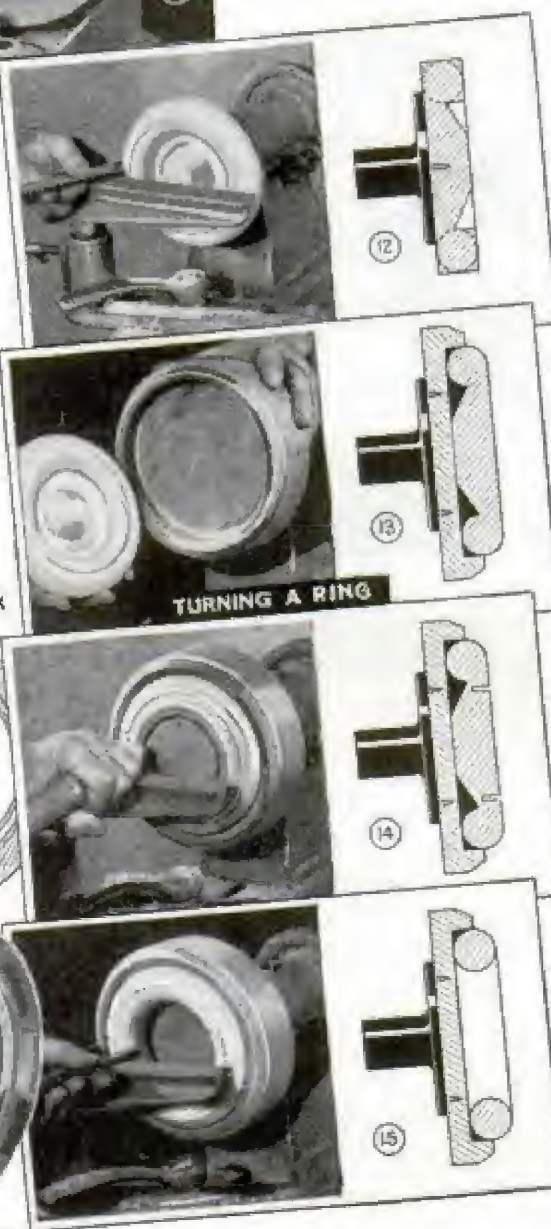
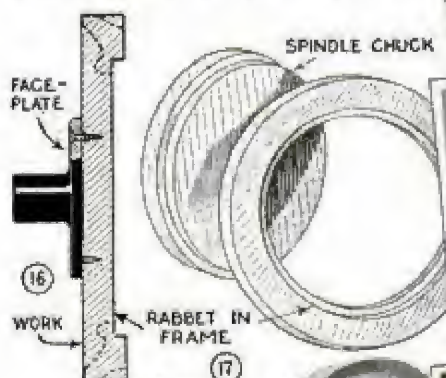
faint line, as in Fig. 4. Next, carefully caliper and turn the narrow neck at the dead-center end to $\frac{3}{4}$ -in. diameter. The ball can now be cut off at the live end, as in Fig. 5. A wood chuck is made up, and is mounted on the single-screw center, or, better, fitted by means of a set screw to the end of

the lathe spindle. The chuck has a $\frac{3}{4}$ -in. hole in it to take the stub of the ball, as can be seen in Fig. 6. Sanding with a piece of paper held between the ball and a $\frac{1}{4}$ -in. plywood template of the same diameter as the ball, as shown in Fig. 7, will bring it to

an exact round, after which it is cut off carefully. Where several balls are to be made, they can be turned in line, as shown in Fig. 8. Notice that a spear-point tool is worked directly over a wooden template to obtain the proper shape at the center of each ball. After the center is perfect, the balls can be cut apart and finished in a cup chuck, shown in Figs. 33, 35 and 36.

Figs. 9 to 11 show various cuts used in faceplate turning. Differing from spindle turning, practically all cutting on faceplate work is done by scraping. The chisel must be inline with the center of the work, especially when the face of the disk is being worked. Fig. 9 shows one of the most common

methods of surfacing, in which a skew chisel is advanced across the face of the work. Surfacing is also done with the edge of a spear-point chisel, as shown in Fig. 10,





TURNING A NAPKIN RING ON A SPINDLE CHUCK



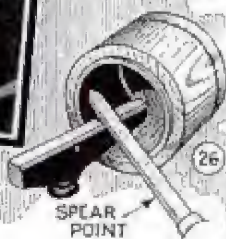
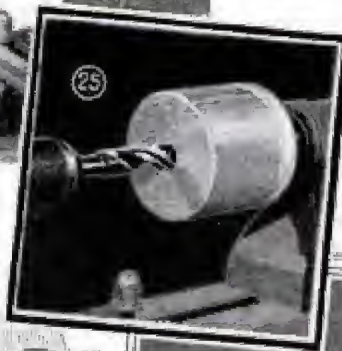
back of the frame is cut first, this being done while the work is mounted on a faceplate, as shown in Fig. 16. The rim is then used to hold the work on a spindle chuck, as shown in Figs. 17 and 18.

The turning of napkin rings and similar hollow cylinders offers another example in the use of the spindle chuck. As shown in Fig. 19, the napkin ring is first finished on the outside and bored halfway through, this being done while the work is mounted on the single-screw center. A suitable spindle chuck is then made up to fit tightly inside the ring, as shown in Fig. 20. Mounted on this spindle chuck, the opposite end of the ring can be turned out, Fig. 21.

Boxes and similar turnings whose bottoms are too thin to take screws must be mounted on backing blocks. In the example, shown in

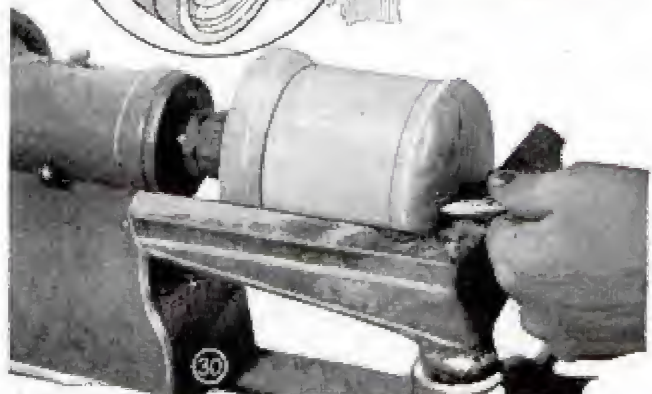
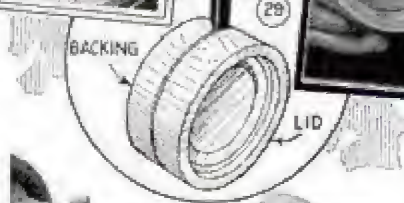


TURNING A BOX



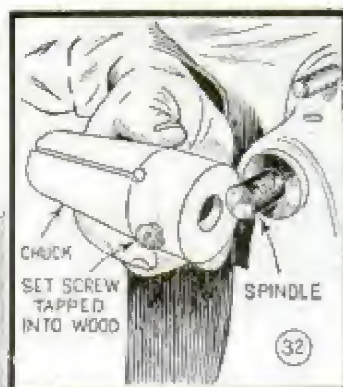
and also can be done with a flat-nose chisel.

A job that involves both faceplate and chuck work is the turning of a ring, as shown in Figs. 12 to 15. The work is first fastened to a suitable faceplate to permit the outer portion of the ring to be turned, after which the partly finished ring is put in a recessed chuck. This must be turned carefully so that the ring will be a "press fit." A parting tool now is used to cut away the center of the ring. Templates should be used frequently to check the progress of the work. Turned picture frames and trays are worked in much the same manner as a ring. The recess in the





USEFUL LATHE CHUCKS



best done with a flat-nose chisel by inserting it into the backing block about $\frac{1}{8}$ in. away from the joint and in the end grain, as shown in Fig. 29. The lid is now mounted on the box and the outside of both lid and box turned, Fig. 30. Keep the work on the faceplate until it is polished or otherwise finished, then sand the joint between the box and the lid lightly for a good working fit, and remove from the backing block.

Chucks, other than those already mentioned, are frequently useful in lathe work. A common type is shown in Fig. 31 and in 32. This chuck can be made any suitable size to accommodate the work. In use, the work is first turned between centers to

form a plug which can be gripped tightly in the chuck by means of plywood ring. Fig. 34 shows a similar chuck, but without the expansive feature. The hole can be tapered or straight as de-

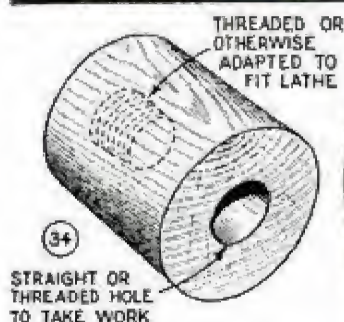
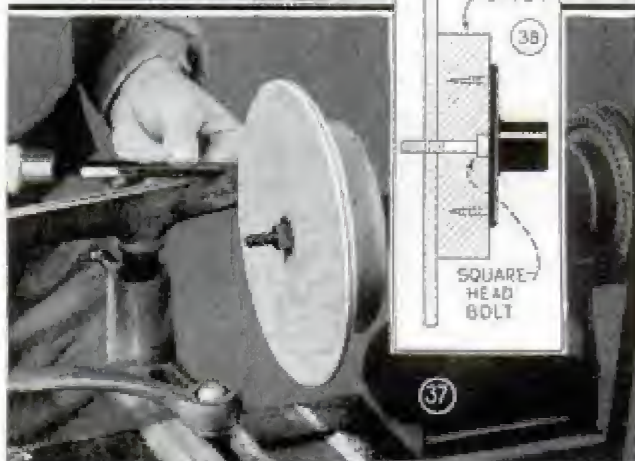


Fig. 22, the stock for the body of the box is glued to a soft-wood backing block, Fig. 24. A piece of paper must be placed between the joints so that the work can be separated easily from the block. The lid for the box is mounted in the same manner on a second block, this, in turn, being fastened to a suitable lathe faceplate.

The inside of the lid is turned first, Fig. 23, after which the inside of the box is turned out, Fig. 27. If you have a slide rest, by all means use it for deep boring like this. The center can be turned out equally well, however, with a spear-point chisel or skew, as shown in Fig. 26. In either case, it is usually simpler to start the hole by drilling, as in Fig. 25. The inside of both lid and box completed, the lid can be tested on the box, as indicated in Fig. 28. A tight fit is essential. The lid can now be separated from its backing block. This is

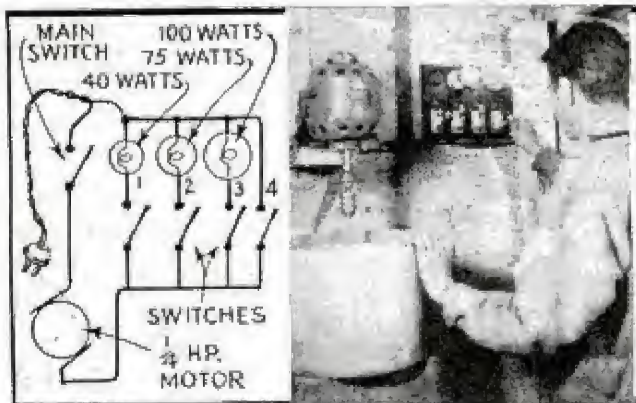


sired. This kind of chuck is ideal for turning wood goblets and similar work, as shown in Fig. 33.

Figs. 35 and 36 show a cup chuck, which is frequently used in turning balls. The use of the cup chuck for such work involves two important points: The portion of the ball which is seated against the chuck must be finish-turned; if it is not correctly shaped, the work will be out-of-center. The tailstock support for the ball must turn with the work in order to prevent burning. A spinning center, as shown in Fig. 36, solves this problem perfectly, but good results can be obtained by simply inserting a piece of leather between the ball and the cup center, as shown in Fig. 35. Figs. 37 and 38 show a useful chuck for turning disks and other work having a central hole. Its construction and use are apparent from the sketch and photo.

Lamp Rheostat Controls Speed of Electric Motor

To control the speed of a motor driving a mixing machine in a bakery, this simple lamp rheostat has been used successfully.



Rheostat consisting of three electric lamps used successfully to control speed of 1/4-hp. motor

As shown in the detail, the rheostat consists of a 40, a 75 and a 100-watt lamp, each provided with a switch so that any one of them can be cut in. Also, there is a fourth switch to operate the motor on full amperage and a main switch to cut-off the current entirely.

—Pat Fairmont, Cleveland, O.

☞ When placing a dish on ice, put a fruit-jar rubber under it. The ring will adhere to both the ice and dish and tend to prevent slipping

Small Gutter on Show Window Keeps Water Off Sidewalk

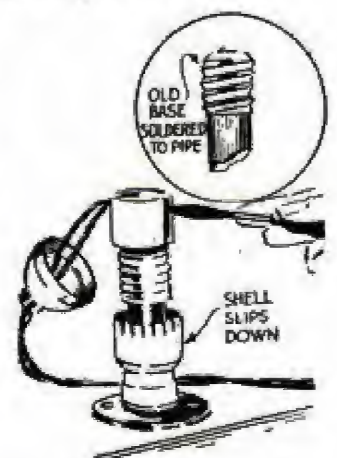


Gutter at bottom of show window drains dirty water into a bucket and keeps it off sidewalk

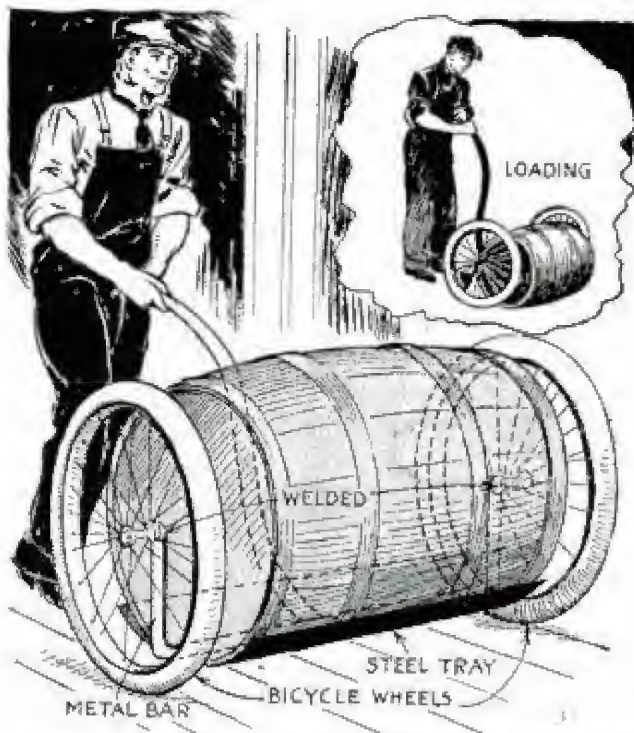
Getting dirty water on sidewalks in front of stores, which often results when washing the windows, can be prevented by using a small gutter or trough at the bottom of the glass as indicated. The gutter is a permanent fixture and is attached at a slight angle so water running into it will drain into a bucket placed at one end.

Jig for Wiring Light Sockets

Used to speed up the work of wiring light sockets, this jig consists of a 1/2 by 4-in. pipe nipple screwed into a floor flange, which is bolted to a bench top. The brass base of a standard light bulb is cleaned out and soldered to the top of the pipe. In use, a socket is screwed into the base, the cap removed and the shell allowed to slip down out of the way while connecting the cord to the binding terminals.—W. C. Wilhite, Carlinville, Ill.



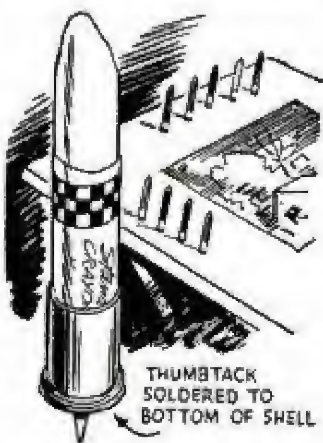
Barrel Carrier on Bicycle Wheels Is Easy to Push



Heavy barrels are easily loaded onto this carrier as it only clears the floor by about 2 inches

This simple carrier will be found handy in factories, warehouses, etc., where the workmen often have to move heavy barrels. It consists of a curved sheet-steel tray, which is riveted to a metal-bar axle. This is bent to a U-shape so that it reaches almost to the floor when the bicycle-wheel spindles are welded to its ends. A long curved handle is also welded or bolted to the axle. The tray must be of strong metal that will not bend easily.

Cartridges Hold Artist's Crayons



bottom of the shells so that they could be placed on the drawing board in any convenient position. If necessary, the ends of

To keep his crayons neatly arranged on the drawing board where they would be within easy reach, one artist made a number of holders from large cartridge shells that had been fired. Thumbtacks were soldered to the

the crayons can be shaved down to slip into the cartridges easily. Or, the ends of the cartridges can be flared with a hardwood stick tapered sharply at one end.

Jeweler Keeps Tiny Watch Parts in Rubber Rings

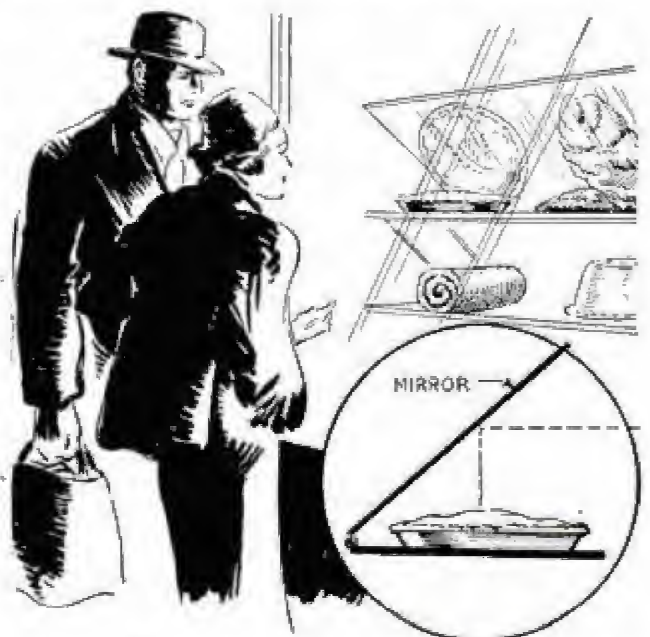
To keep small screws, wheels and other parts of a watch or clock from being scattered over the table when taking it apart for repairing, one jeweler uses rubber rings $\frac{1}{4}$ in. wide, which



he cuts from the end of a large garden hose. He finds the rings especially useful in keeping the parts of individual watches or clocks separated, and, being quite shallow, the rings allow the tiny parts to be picked up easily.

Pastry Displayed by Mirrors Set at 45-Degree Angle

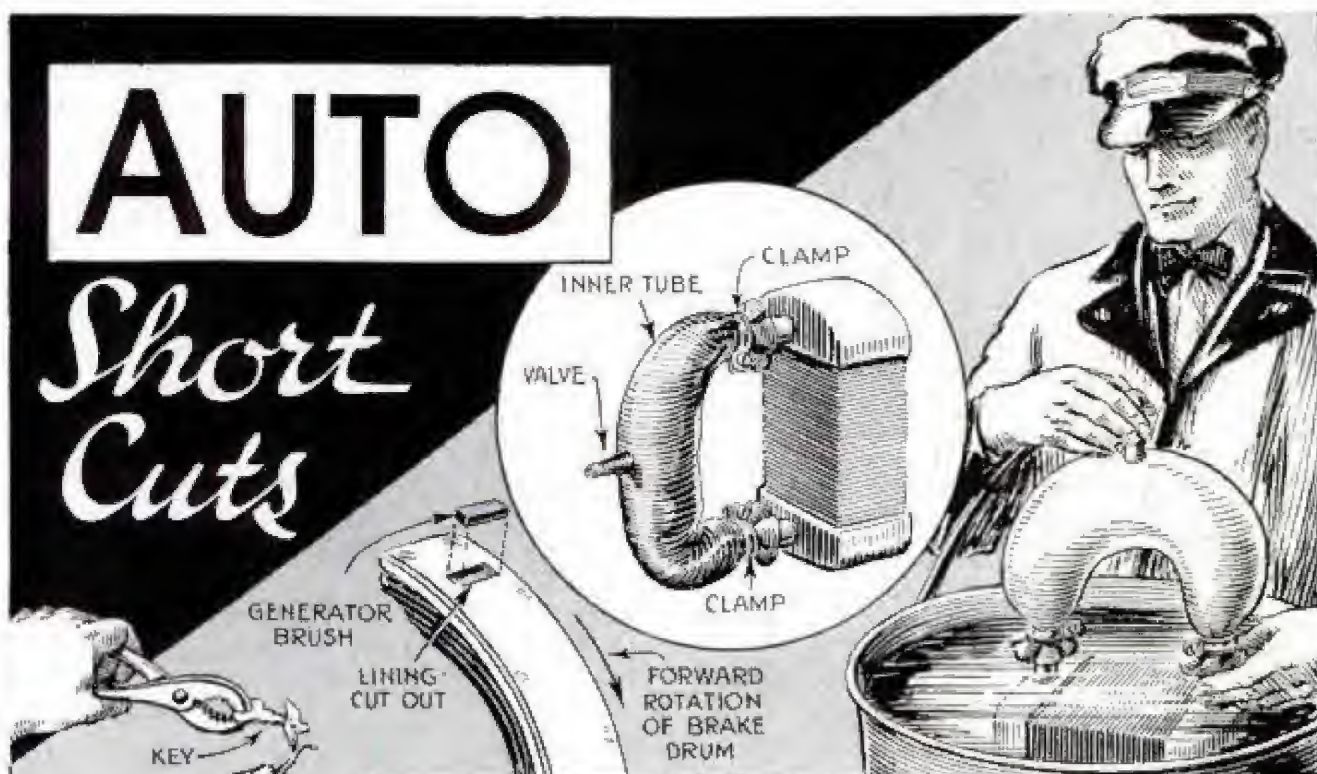
The owner of a bakery has a novel method of displaying his pastries. The goods are set on a shelf and a mirror is placed behind them at an angle of 45° . Strips of molding at the top and bottom of the display shelves hold the mirrors in place.



Mirror displays pastries set on shelf so customers can get a top view

AUTO

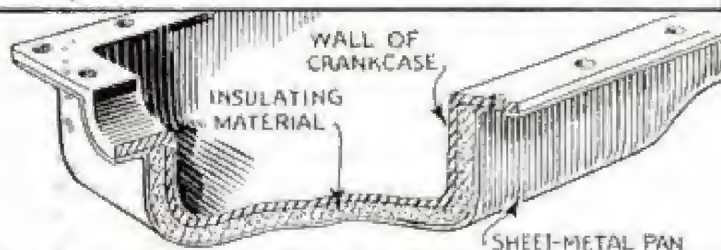
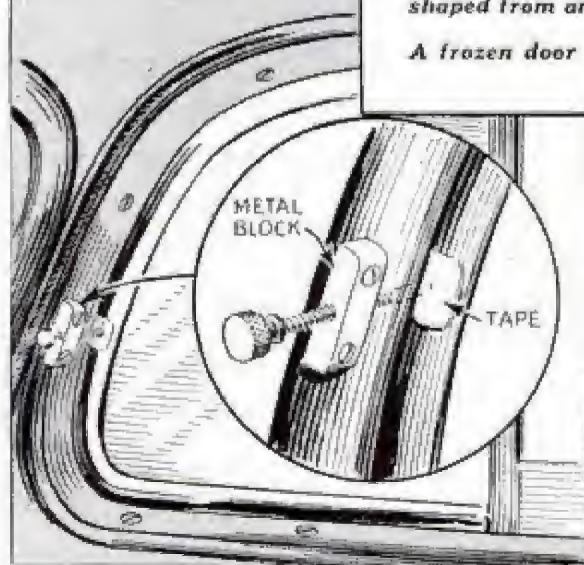
Short Cuts



Above, leaks in hot-water heater indicated by bubbles when heater is submerged in tub of water and air pumped into the section of inner tube

Mortised into the brake lining about 1 in. from the end, a small insert shaped from an old generator brush will often "cure" groaning of brakes

A frozen door lock is thawed by preheating the key before inserting it

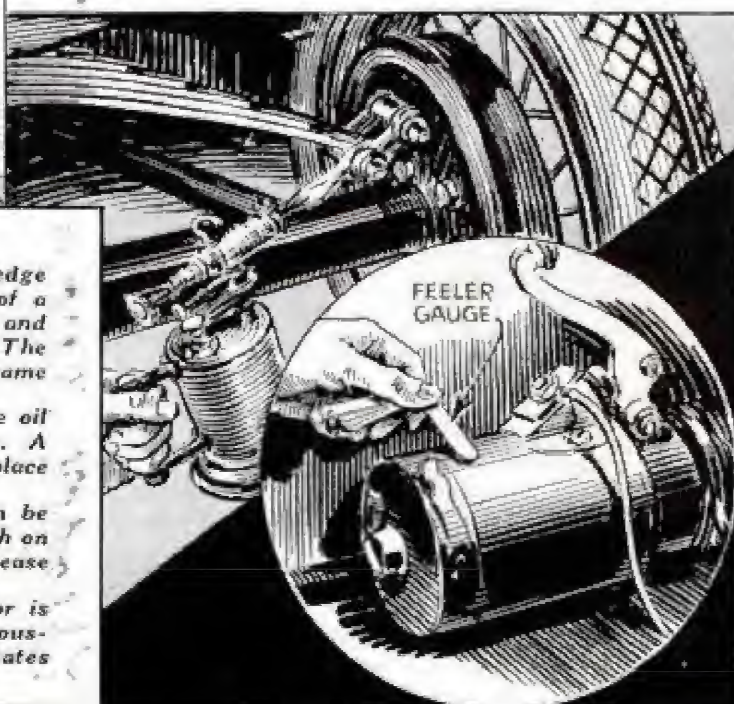


Entering a car by prying out the trailing edge of a no-draft wing is prevented by use of a metal block fitted with a long thumbscrew and fastened to the window frame as above. The screw is turned to bear against the wing frame

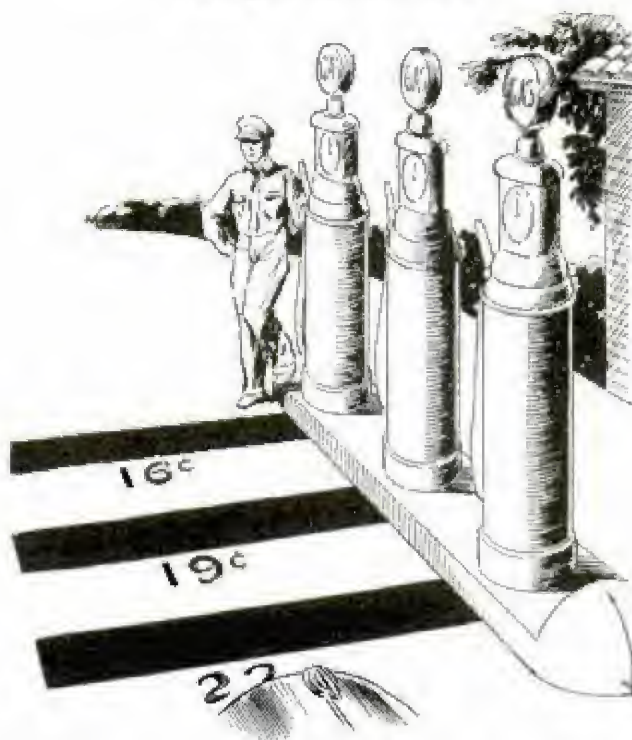
Insulating your oil pan as above keeps the oil at a uniform temperature in cold weather. A sheet-metal pan holds the insulation in place

Clogged grease holes in shackle bolts can be opened by directing the flame of a blowtorch on them for a minute to melt the hardened grease

Right, if the armature of a starting motor is rubbing, a feeler gauge held close to the housing will be attracted to it when motor rotates



Gasoline Price on Driveway Helps Motorists

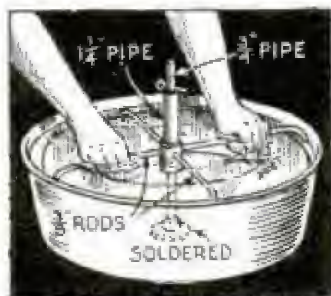


Printing the price of gasoline on the driveway aids motorist to stop in front of right pump

By printing the price of his gasoline on the driveway in front of the pumps, customers could see at a glance the pump from which they wanted gas. If desired, the name or grade of gasoline can be printed on the concrete in front of each pump. Large, white letters painted on a black background are easily seen, and will last a long time.

Keeping Inner Tubes Submerged in Test Tank

The difficulty of keeping large inner tubes submerged in a test tank while inspecting them for leaks, led one repairman to make the device shown. A length of $\frac{3}{4}$ -in. pipe with a floor flange fitted to one end, was soldered in a vertical position in the center of the test tank. A shorter length of $1\frac{1}{4}$ -in. pipe was fitted with a coupling, which was drilled at four equidistant points and tapped to receive lengths of $\frac{3}{8}$ -in. rod. When a tube is placed in the tank, the



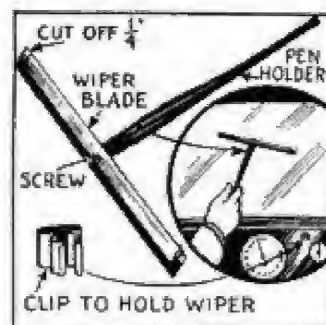
of the test tank. A shorter length of $1\frac{1}{4}$ -in. pipe was fitted with a coupling, which was drilled at four equidistant points and tapped to receive lengths of $\frac{3}{8}$ -in. rod. When a tube is placed in the tank, the

wheel piece is dropped over the upright pipe and forced down to submerge the tube, after which a key is inserted in a hole drilled through the vertical pipe, holding the inner tube under water while it is rotated slowly to detect the leaks.

Hand Wiper to Clean Windshield Inside the Car

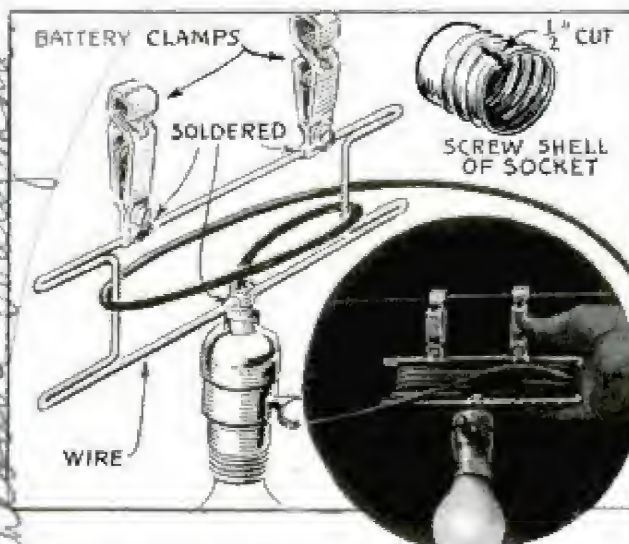
When the windshield "fogs up" on the inside during cold weather, I find that it can be kept clean with a windshield-wiper blade screwed to the end of a short dowel rod or penholder, which serves as a handle. A clip can be provided on the instrument panel to carry the wiper, or it can be kept in the glove compartment.

—Tom Robertson, Long View, Wash.



Large Lamp on Reel under Hood Illuminates Motor

To get a strong lamp that will brightly illuminate his entire motor in case of trouble at night, one motorist uses a 6-volt, 25-watt lamp on an improvised reel, which is suspended from one of the radiator tie rods underneath the hood. The reel is made from heavy wire and is suspended by a couple of battery clips. The lamp is



New type lamp of 6 volts, 25 watts, hung on reel under car hood gives plenty of light when needed

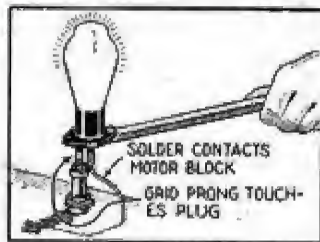
Trailer Supply Co.

of the new type which looks like a regular 110-volt house lamp, and it can be obtained at most large accessory stores or mail-order houses. To keep the lamp from being loosened by vibration, a slit is made in the screw shell of the socket and one edge is bent inward slightly to press firmly against the screw base of the lamp as indicated.—C. E. Packer, Chicago.

Spark Plug Tested by Radio Tube

Fitted with a socket and attached to a suitable handle, an old radio tube of the 201A or 171 type makes a good tester for spark plugs. Saw off the two filament prongs and attach a 3 or 4-in. length of wire solder to the plate prong. Now push the solder and the two prongs into the socket. To test a plug, start the motor and then rest the tube grid prong on the top terminal of the plug and let the solder

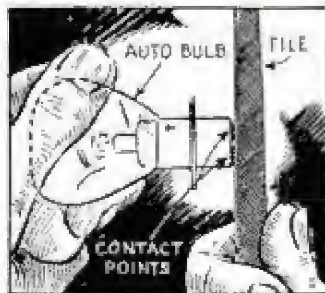
make contact with the motor block. If the plug is firing regularly, a distinct glow will be seen in the tube. If the plug is not up to standard, the glow will be spas-



modic and of varying intensity. Or, if the plug is not firing at all, there will be no glow. A clear glass tube should be used, but if one is not at hand, hold the opaque type horizontally over an alcohol flame for a moment, and a circle of clear glass will appear as the inside coating of the tube is driven away by the heat.

Installing Headlight Lamps

Trouble often experienced in installing headlight lamps that have flanges around the bases with holes to slip over pins in the socket can usually be prevented by flattening the contact points of the lamp with a file. This permits the points to slip by the spring plungers in the socket easily so that there is less danger of twisting the bulb loose from its base.



Part of Truck Tailboard Drops When Unloading Boxes



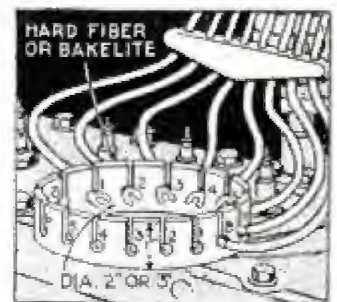
Boxes extended onto a lowered tailboard easily unloaded if upper part is hinged to drop down

When a truck is loaded with boxes and crates so that they come about flush with the edge of a lowered tailboard, the difficulty of getting the hands under the crates on the bottom to lift them can be eliminated by hinging the upper part of the tailboard as shown. When the tailboard is lowered, the hinged part is held horizontally by lengths of iron bars slipped through brackets.

Holder Keeps Terminal Ends of Cables in Order

Auto mechanics and others who often work with electric cables will find this holder handy for keeping the terminal ends of the cable wires separated for easy identification. The

holder is a narrow section of fiber or Bakelite tubing with slots formed by first drilling and then cutting with a hack saw. The holes are numbered so that the wires can be located in order.



Tag on Pencil Protects Chart from Greasy Hands



In shops where mechanics are required to write certain records on a wall chart from time to time, the difficulty of keeping

the chart unsoiled by grimy hands can be overcome with a shipping tag. This is tied to the pencil and is held between the chart and the hand of the writer, as shown, while the notations are being made.

Door Spring Used as Compressor for Piston Rings

A screen-door spring shortened to fit tightly around a piston provides a good piston-ring compressor. The spring, aided by the mechanic's fingers, will keep the ring compressed. As the piston is pressed into the cylinder bore, the compressor rolls up to the next ring.



For extremely narrow rings, a spring of small diameter is desirable so that it will stay on the ring until the latter has entered the cylinder.—C. E. Packer, Chicago.

The Next Issue

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Takes you through the tricky processes of turning special spindles such as the oval, spiral, inlaid, club-foot, post-blocked and combination types.

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New Metal-cutting Band Saw

It takes the place of a power hacksaw in cutting off bars and shapes; it is used in the toolroom for sawing off tool, die and fixture stock; it will cut uniform strips from sheets; it saves hours of time in cutting templates and similar tools, and will cut almost any material, such as asbestos, mica, vulcanite, fiber, etc. Four low metal-cutting speeds and one high speed for wood sawing.

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Chevrolet Motor Company
Fisher Body
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it's tops for mellow taste.

(right) One pound of Prince Albert
—the "biteless" tobacco—placed in
an attractive Christmas gift package.

(right) A pound of Prince
Albert, in a glass humidor
that keeps the tobacco in
prime condition and be-
comes a welcome possession.



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When writing to advertisers please mention Popular Mechanics

How to Make Home Movies

(Continued from page 20)

2105 An occasional panoram, however, provides a helpful and interest-promoting change of pace when, and only when, it is properly executed. Such a panoram should be used only on distant objects. It should be executed slowly and evenly. It should always conclude, not start, with the most interesting objects within view. And it should begin with a steady shot, then a short panoram to the piece de resistance, which should likewise be held steady for several seconds.

When you take your camera to a football game you will certainly want to follow the play as it surges up and down the field. Much of the time the ball carrier will not run beyond the limits of your camera's finder, and when he doesn't, there's certainly no reason to blur the scene by moving the camera. But when one of the backs breaks loose for a long run, stay with him. By doing so you will probably blur the background of field and opposing rooters. But who cares? It's the action you're after. This is equally true when you are filming any moving objects which cannot be filmed at an acute angle and must therefore pass you and your camera at right angles. If you keep them in the center of the finder, the magic of movies causes them to "stand still" for your movie audiences, and the stationary background to move. This type of camera motion is thoroughly justified.

Panorams, oddly enough, are an unnatural presentation of subjects. The human eye does not panoram; it darts here and there, pausing upon interesting points, hurrying across the uninteresting. And right here, incidentally, is where the movie maker has the edge. For he can entirely eliminate these uninteresting areas by merely filming the interesting—in steady shots of several seconds' duration.

At about this point the alert reader will say, "Fine, panorams are out. But how about that continuity idea? Where does that fit into the picture of filming a building, for example?"

In this way: Make a long shot of the building, showing all of it and much of its surroundings. Then one a bit closer. Then a series of close-ups of interesting aspects of the building, grillwork, plaques, orna-

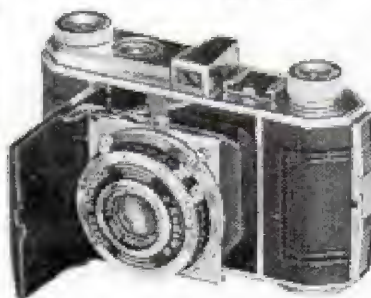
(Continued to page 118A)

PREVIEW of

Miniature Kodaks

KODAK DUO SIX-20, SERIES II (right) New, improved—the "miniature" that takes album-size pictures (1½x2¼). Kodak Anastigmat f.3.5 lens; 1/500-second Compur-Rapid shutter. Shutter release on camera body. Bracket for range finder. Single-finger bed release. Die-cast metal body. Price remains

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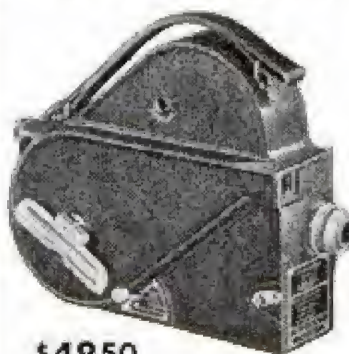
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(left) An Fastman 16 mm. movie camera at the lowest price ever. Kodak Anastigmat f.3.5 lens. Fixed focus. Triple-speed device. Simplified gate enormously facilitates loading. Takes all 50- or 100-foot 16 mm. Ciné-Kodak Films. Price, \$48.50.



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(right) World's most widely used 16 mm. home movie camera. Makes clear, brilliant movies at the touch of a lever. Performs beautifully for the beginner, and as his skill increases, responds to every exacting demand. Loads with full 100 feet of 16 mm. film. With f.1.9 lens, **\$8850**



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MAGAZINE CINÉ-KODAK

(left) Loads in three seconds. You don't touch the film at all—it comes in a magazine. Just slip the magazine into place, close the camera cover and you're ready to shoot. To switch from one film to another, you merely take out a partly used magazine, slip in one of the others. Effortless loading is only one of the six new features in this remarkable pocket-size movie camera. Equipped with fast f.1.9 lens, \$125; including combination carrying case, \$137.50.

How to Make Home Movies

(Continued from page 116A)

mental doors, towers, foundations, archway-framed views from within the building, all of the little bits you notice and admire. Then wind up your sequence with another distant shot. That returns your audiences to the initial scene, and logically concludes the sequence.

Another way to take better home movies is to avoid making all-inclusive shots of every subject—backing up until the scenes appear in the camera finder in their entirety. Here, again, is a heritage of snapshot making, trying to get as much as possible into one shot because it will probably be the only shot made of the subject. Yet, because movie subjects are to be filmed in

voice destroys all the color of a verbal story. Mix 'em up. Start off slowly. Speed up toward the end. Conclude with another prolonged shot.

Some subjects, themselves, suggest the scene length. Fast-moving action recommends terse, brisk shots. Dreamy tropical subjects call for extended exposures. Close-ups generally demand brevity; scenes, that you stay with them for a while.

Frankly, isn't this all ridiculously manifest—now that it's been called to your attention? You sense these things in a screened movie. You know when they are there. And you are equally conscious of their absence.

How to make better movies is, after all, to make pictures that are really movies. Remember every second that yours is a movie camera; that, although you may take but one scene at a time, they are immutably joined in succession by movie projection. Think how your shots are going to appear when screened. Think of what you've already filmed, and of what you will film next. Think of your camera finder as being a screen. What you see there when you press the exposure button is just what you'll see later in your living room. In movie making, it's finders keepers.



Try "slow motion" when you film a football game. You can analyze the play afterward

sequences, you obviously desire to achieve just the opposite effect. You don't want to tell all at once. But you do want to present the complete story, and should, therefore, make your shots at varying distances, with emphasis upon close-ups.

Close-ups tell the story. In life you grasp the hands of people, look them in the eyes. You don't back up for a full-length. So forget the feet. Get the features.

One sure-fire method of spoiling good movies is to make all scenes of equal duration. Movie camera manuals harp upon shots of ten seconds' length. It's a good idea—but only as a guide. For the duration of scenes establishes the tempo of a movie sequence. Equal duration makes movies drag, just as effectively as a monotonous

Side Lights Protect Bicyclist

Bicyclists can have added protection from traffic at night by installing a headlamp which throws warning beams on each side. There are two small side windows in arms protruding into the cone of light from the headlight, diverting beams to the side without interfering with the light thrown forward.



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Sled Thrills by Slide Rule

(Continued from page 69)

150 recognized bobsledders in America and scarcely half of these are licensed drivers. In Europe, where there are over forty standardized runs in contrast to America's one, participation in championship events is not so restricted.

The bobs used on the big slides are engineered to a fraction of an inch and are as carefully and stoutly constructed as any racing car. The four-man bob is eleven feet seven and one-half inches long and weighs 485 pounds. The seat rests ten and one-half inches off the ground. The two-man bob is nine feet long and weighs 352



Courtesy German Railroads

Constant practice teaches the drivers the tricks of each perilous turn

pounds. American sleds, which cost between \$500 and \$600, are steered like a motor car while the European models employ tiller ropes.

A German engineer, Stanislaus Zentzytzki, has designed the leading bob runs of the world, including those at Lake Placid and Garmisch-Partenkirchen in the Bavarian Alps. The American run is his masterpiece, however. It cost \$200,000 to build. The average drop is ten per cent with a minimum grade of eight and one-half and a maximum of fifteen per cent.

The surface of a bob run is of glare ice, made of a mixture of snow and water, and is covered in the straightaways with a thin frosting of snow so the sled runners may

15964
bite in and hold the track. The turns are built on a foundation of crushed rock, padded by turf. Some are twenty-two feet high, their towering banks running up almost at right angles to the bottom. They are built with geometric precision so as to hold the giant steel sleds, which with cargo weigh up to 1,200 pounds, as they go spinning around at fifty miles an hour. On the straightaway, a run is six and one-half feet wide while on the curves the width varies from ten to twenty-two feet. Eight thousand feet of pipe running from top to bottom expedite the spraying of the course, more than 20,000 gallons of water being used daily for this purpose.

When a bob starts its downward dash, the run must be clear of all obstructions,



Another step in the construction of the run, which is carefully engineered

sleds or loose ice. The slide is patrolled constantly and as an added safeguard the seven telephone control booths can observe every foot of the run. No bob leaves the starting line until "Clear Track" is reported from each station to the other and final word is relayed back to the starter at the top. Only one sled is permitted on the track at a time. Three telephone circuits run from the top to the bottom. The first is a direct circuit, the second is a one way connecting the intermediate control booths, and the third is for operating the electric

(Continued to page 123A)

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Dare-Devil Scientists of the Air

(Continued from page 37)

at the bottom of a dive depend greatly upon their own physical condition. Fighting planes are often tested up to nine "G's," which means that they are pulled out of a dive so rapidly that inertia alone tends to make them keep traveling toward the earth with a force nine times normal gravity. The same tremendous pull is exerted against the pilot. He slumps down in his seat, blood tends to drain away from his brain, and in some cases blood vessels have burst and the men lapse into momentary unconsciousness. Easing forward on the stick reduces the sharpness of the strain.

Once a pilot who pulled back too sharply on the stick built up the tremendous load of twelve times normal gravity. The strain bent the airplane into a mass of junk. The fuselage buckled, the wings bent back, cracks opened in the windshield and the gasoline tanks caved in. The pilot was barely able to land the wreck. After that he went to the hospital.

Fighting planes have to be put through barrel rolls, inside and outside loops, and many other stunts, but a test pilot does eighty-five per cent of his work on the ground instead of in the air. Men like Vance Breese and Eddie Allen, who are paid as much as \$5,000 for test flying a single ship, earn their money not because they risk their necks but because years of thorough training in aeronautics, engineering and design enable them to diagnose and correct faults in a plane still on the ground, to understand exactly what the trouble is when a ship responds improperly in the air, and to advise in design and construction. Wind-tunnel tests take many of the bugs out of a new airplane even before it is built, but in spite of careful preliminary work trouble may be encountered when the finished airplane is first flown.

Once the ailerons broke on an airplane Breese was flying for the first time and he was left practically helpless in the air. He came down toward the field with the prayer that speed alone would keep the wings level. Instead of trying to make a normal landing he skimmed along the runway at 125 miles per hour, getting his

(Continued to page 124A)

Sled Thrills by Slide Rule

(Continued from page 121A)

timing device that records the speed of the bobs to hundredths of a second.

In the event of a spill, the operator who has had word a sled left the telephone station above his, notes it has not passed his station and instantly calls the starter. The track is closed and the operator goes down into the slide to investigate the trouble. The dangers of bobsledding may be measured in direct ratio to the driver's skill and the discretion of the brakeman. The captain, seated in front, steers the sled and directs operations at the turns. It is his job to signal the brakeman in the rear when to apply the three-pronged metal rake that digs into the ice. A brakeman never acts on his own initiative and braking on a curve is regarded as the unpardonable sin. If the speed is excessive he applies the brake just before the turn is reached. The secret of taking a turn correctly, explains J. Hubert Stevens, famous pilot, is to enter high and come down the bank fairly early. If a sled enters the curve too low it is apt to hurtle over the rim during the final stage of the turn.

Correct bobbing can increase a sled's speed. A smartly synchronized crew can be a big help to gravity with this movement, which is, in effect, a rowing stroke in reverse. The shock of raising the body must be transmitted through the legs, so the whole force is applied with the feet on the footrests. The crew lift slightly out of their seats when the pressure is greatest.

Allan Washbond is perhaps the greatest bobber in the world. He is only five feet nine inches tall and weighs 235 pounds. By a judicious use of his weight, which is centralized around his hips, he has lowered marks in the two-man division as much as a full minute in this sport, which deals in hundredths of a second. His technique differs from most riders in that he bobs with his hips instead of his body.

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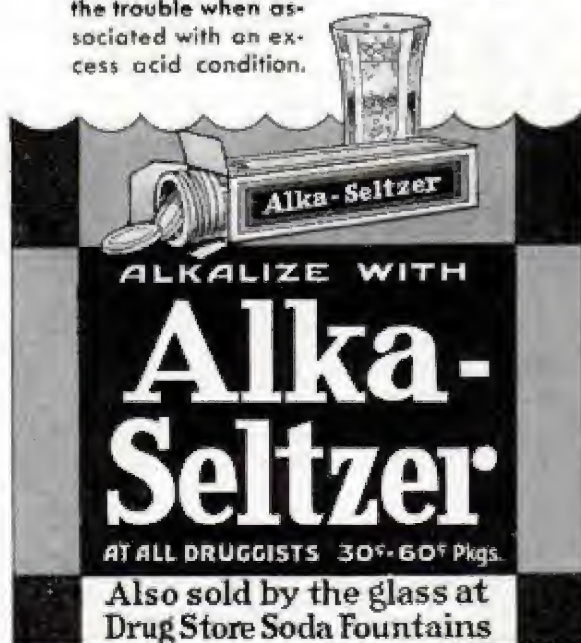
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Dare-Devil Scientists of the Air

(Continued from page 122A)

wheels within inches of the ground before closing the throttle. That saved the plane. It was down safely on the ground before a wing had a chance to drop.

Another time the propeller of a fighting plane stuck in low pitch after the take-off and the motor literally blew up 500 feet in the air. Breese couldn't land straight ahead because the airport was surrounded by water. The easiest thing to do was jump, but there was \$250,000 tied up in the new plane he was flying. He had twenty seconds in which to make his decision, cut the



Scientist of the air climbing into cockpit for test flight in a new airplane

switch, get his wheels and flaps down, turn the plane around and make a down-wind landing. It took plenty of luck as well as skill and the landing was successful.

Once a pilot in a normal dive delayed his pull-out until he was within fifty feet of the ground. As he started to flatten out an aileron gave way and the plane started to fly to pieces. Without hesitation the pilot pulled way back on the stick, pointing the nose of the plane toward the sky, and depending upon his tremendous speed

(Continued to page 126A)

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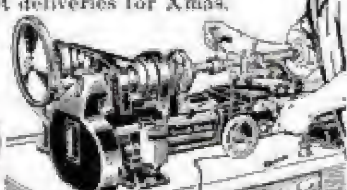


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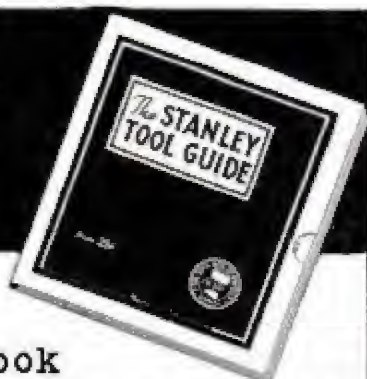
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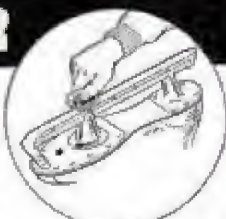
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(Continued from page 124A)

to carry him back up to a safe altitude. He rode the wreck up to 500 feet where he had room to step off and get his chute open.

Test pilots are always encountering new problems and hazards. With design tending toward smaller, heavier fighting planes, spins are harder to control and correct than before. Another new thing is the "tip stall" that makes a plane unmanageable at normal landing speeds. The wing roots are still supported by air but the wing tips are stalling, causing loss of aileron control. Some kinds of control surface and wing flutter that occur only at certain critical speeds can be studied only in the air. It may take scores of flights to study and correct such a vibration.

Attempts are being made to make the pilot's job easier by developing automatic



Chronometer stop watch by which pilot checks performance of plane during test

cameras that photograph all the instruments on the board at short intervals. Sometimes, instead of jotting down the readings on his leg pad in flight, a pilot reads them aloud into his radio microphone and they are recorded by a stenographer listening in on the ground. It usually takes several months and hundreds of routine flights, testing the plane and engine at every attitude and altitude, before the trial flights are finished.

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We want a reputable, honest man in each county. This man need not have any special experience or more than ordinary ability, but he must be honest and courteous.

Such a man we will start in business for himself. You can make far above average profits in the rug-cleaning business—a high-grade business all your own. Many earn \$125 to \$200 per week—some considerably more.

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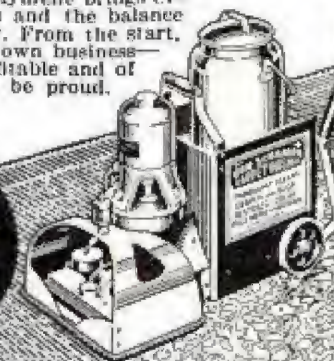
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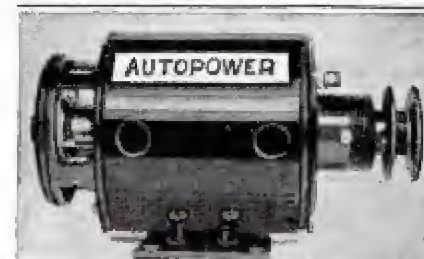
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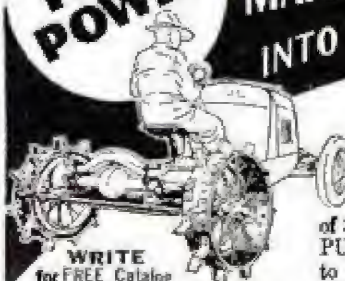
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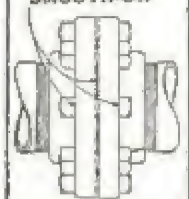
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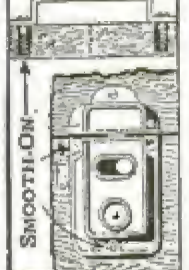
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1-38

Broadcast Gives "Sight" to Ears

(Continued from page 92)

of a super-imposed scene that was entirely different—an announcer, modern, up to date, describing this timeless city.

Reis would have preferred going outdoors to some mighty stadium. But he couldn't on account of that timeless angle—New York's most isolated stadium would necessarily catch familiar city sounds—and on account of his cast. Obviously he couldn't have an actual cast of 10,000. Two hundred men, women and children were the most permitted. He had to devise some



Actor reading his lines inside acoustical screen to get effect of small place

means of amplifying or adding to those 200 voices mechanically, to make them sound like the entire population of a city.

So he chose the Seventh Regiment Armory in New York, a huge block-long edifice. It was big enough so that an actor, standing at one end, could speak into a microphone and his voice would "decay" into the distance, in much the same way that it might disappear into the great space of outdoors. Yet it was at the same time capable of being used for the trick of making 10,000 voices out of 200. Reis did this by recording the shouts and cries of his 200 people at rehearsal. He then had four different copies made of the recording, which he gave to four different assistants stationed at strategic positions around the

armory. At a given signal, these assistants played the records over loudspeakers, which projected the shouts into the armory at the same time that the live cast of 200 was also shouting over the microphone. As each record was played on a turntable of varying speed, the result was that of a confused human rumbling. But the modern announcer couldn't speak in the same kind of acoustical space as that of the city shouters. So Reis built a special box, a complete little shack of acoustic panels, similar to those used for broadcasts of races and football games. Sound-proofed, with a separate microphone of his own, and in communication with Reis only by headphones, the announcer sounded really in a "world apart."

Reis isn't content with ordinary auditions of actors or ordinary casting of his radio dramas. Instead he tests his actors' voices by means of the resonoscope, a device uncannily accurate in showing the exact pitch, tone color, intonation and balance of a voice. Merely by speaking into the small microphone attachment of this instrument, the actor is enabled to see the colored visual pattern of his own pitch quality thrown upon a portable screen. After finding pitch and tone qualities which suit him, Reis often proceeds to change them entirely, to suit the peculiar need of some scene.

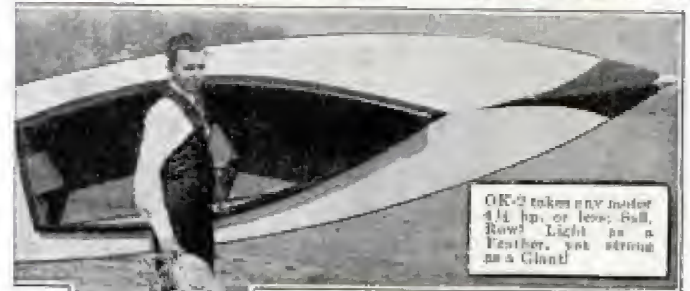
For instance, in an adaptation of Charles Dickens' "The Signal Man," he needed a voice for the signal man that was abnormally dull and dead. No actor, fine though he might be, quite filled the bill. So Reis "deadened" a normal voice by placing the actor inside a heavily absorbent, acoustically dead booth. In "Downbeat on Murder," where he needed to overemphasize the rasping, nasal tone of a nagging wife, he passed a normal woman's voice through an electrical filter, and by eliminating some of the lower frequencies, obtained a high-pitched, thin, unpleasant quality.

Often he uses the filter to represent a voice which in the drama is supposed to be speaking over a telephone wire or a radio set. One of Reis' new effects are sounds he calls "sound abstractions." These are sounds which everybody thinks he has heard, but which in reality do not exist. Such things include the "ringing of silence," in an empty house, the "crying"

(Continued to page 131A)

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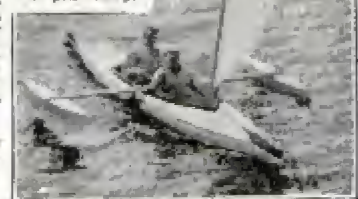
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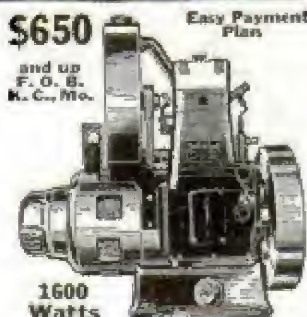
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1070
(Continued from page 129A)

of fog, the weird throbbings and whistlings supposedly heard by patients going under ether. Reis uses a lot of these sounds as backgrounds in the subconscious dramas, in plays where men slowly go mad, drown or suffocate. Sometimes he employs a pulsating oscillator, held far back from the microphone, so that there is just a kind of eerie whistling going on.

Besides these queer "background" sound effects, Reis has added immensely to the resources of radio sound effects by introducing hitherto unheard sounds.

One of these was the beating of a human heart. To secure this sound effect, which beat steadily throughout the drama, becoming louder and louder until it resembled the pound of an orchestral timpani, Reis employed an athlete who lay upon a couch in a separate studio with a stethoscope strapped to his chest. The sound of his heartbeat was picked up by a microphone attached to the stethoscope, and sent over a controlled loudspeaker near by.

Recently, in Ernest Hemingway's "Fifty Grand" which was about a prize fight, Reis employed two prize fighters from a New York boxing establishment, and had them spar in front of the microphone.

In putting sound effects into a radio drama, Reis works under a principle he calls key sound effects. That is, he feels that for artistic drama, only a few significant sounds should be heard, rather than all the sounds actually there in life.

He learned this principle while experimenting with a drama called "Broadway Evening." Designed to show a composite picture of Broadway, the drama called for a scene in a restaurant, Times Square and other famous spots in the city. Reis therefore took his microphone out to the real restaurants, the real streets of New York City, and picked up everything. But the microphone gathered in too much, and the background was chaotic.

Therefore, Reis has decided on a few simple and suggestive noises. In a restaurant scene these days, he'll have only the clinking of forks or the clatter of dishes. In a scene outdoors, he may merely use a single cricket chirping over and over again.

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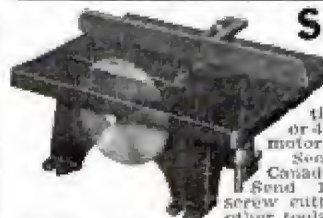
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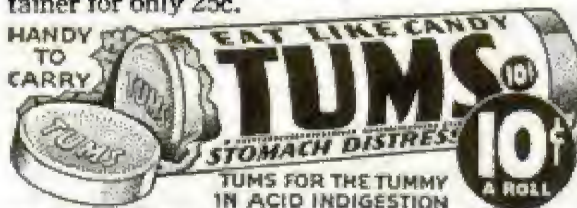
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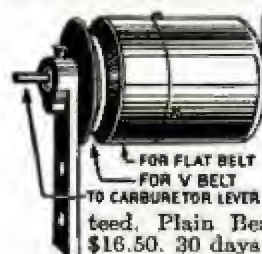
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Chemistry and You

(Continued from Coloroto Section)

For years chemists sought to create rubber independently of the rubber tree. Governments and men, including Edison, tried to produce it from plants and weeds, such as the common goldenrod. One reason for these feverish efforts was that rubber production is practically a monopoly of the Far East—the United States, user of more than half the world's rubber, gets ninety-nine per cent of its supply from that source. Another reason was rubber's inherent shortcomings which science had mitigated but not removed.

Finally, in 1931, the world-sought material was successfully synthesized by du Pont chemists. Fortunately, however, the product was not true rubber—chemically it was not rubber at all! If it had been, it follows that the synthetic substance would have had all of natural rubber's weaknesses. This new material, built up by intricate processes from coal, limestone and salt, looks like rubber, acts like rubber, serves wherever rubber serves, but it is many times more resistant to oil, grease and gasoline, and to alkalis and acids; it offers far superior resistance to sunlight, oxygen, heat and age, and it is less permeable to gases.

This material has been named neoprene. It is produced in quantity and is being used in a wide variety of products—for gaskets, washers, and packings in all industries, for printing rollers, gasoline hose lines, for pistons and cups in oil slush pumps, in covers of transmission belts operating under greasy and oily conditions, in hospital sheeting, balloon fabrics, and on through an ever-growing list. Much mechanical progress that was retarded because of the lack of a rubberlike material without rubber's faults, is now under way, thanks to the synthesis of neoprene.

The price of neoprene is three and one-half times that of the present price of rubber, but on the basis of utility it is cheaper than rubber for many purposes even now, and, although nature may be able to grow rubber at a lower cost than we can make neoprene, if history should repeat itself we may yet see the day when neoprene costs no more per pound than rubber. In the meantime the price of neoprene stands as a limit beyond which the price of planta-

(Continued to page 134A)

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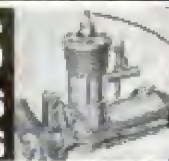
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MOTOR KIT

WOODSTOCK TYPEWRITERS

Chemistry and You

(Continued from page 132A)

tion rubber cannot go. Neoprene has an enormous immediate value in industry, but compared to its potential value its present status is relatively trivial.

Other new rubberlike materials also have been developed here and abroad. Each of them has one or more special properties that make it valuable, and a broad new field in the use of such materials, as well as in the wider use of rubber itself, is opening. Rubber-tired railway and subway trains are now a subject of experiment. In view of the rising opposition to the continuous din of noise that makes our large cities like so many bedlams, it is highly probable that all vehicles such as milk wagons and streetcars will be fitted at no distant date with rubber tires. Carriages were rubber-tired forty years or more ago when rubber was costlier and far less durable than it is now. Developments are pending that may double and even treble the life of motor-bus and truck tires at enormous savings in the aggregate to operators.

(Continued next month)

A New Breed of Racing Cars

(Continued from page 53)

The formula gives the designer with a limited bank roll a better chance than before. It continues for three years, so when he builds a car and gets the "kinks" ironed out, he knows he has something that can be used for three years instead of one. Thus he can afford to put a little more money into the experimental work. Heretofore rules in America were changed annually and designers spent most of their time not in building new cars but in changing old ones to conform to new rules.

For many years, Europe has built the best race cars. In Germany they have the Mercedes and also the Auto Union, an organization involving several motorcar companies. They get their engineering forces together and build a race car. That car is not known by any trade name. It's an Auto Union car. Into it have gone the best engineering brains in the country. When it wins, Germany benefits and German car prestige is advanced.

Why can't our manufacturers do that? For some time, American car makers have

hesitated to put their names on race cars because they feared a loss of prestige if the car lost, and usually a new car doesn't win the first time up. But if our manufacturers would consolidate their engineering facilities, as the Germans have done, they could build American race cars without this disadvantage—and better cars, probably, than any one of them could turn out individually. We are dependent on export to take care of our surplus car production, and if American race cars could win European races, that fact would be reflected in our foreign market.

America stands an excellent chance—although perhaps not an even chance—to win the Vanderbilt Cup race at Roosevelt Raceway in 1938. When road racing was renewed in this country in 1936 with revival of the Vanderbilt Cup races at Roosevelt, American racing interests were unprepared. They had no new cars and built none. In fact, if they had had time to build, they would not have known what to construct. In Europe the three-year rule already was in effect and foreign cars in the 1936 race had been raced for two years on the roads in Europe.

There were no combination men among the present-day American drivers, because our men were fundamentally track men. That was no discredit to them. They just never had an opportunity in track racing to take right-hand turns and to do the braking, accelerating and gear shifting necessary to win a road race. Our drivers were accustomed to a circular or oval track where all turns were to the left and where the throttle was kept virtually wide open all the way. By this, I do not mean that track racing is not a he-man's game. Every track race is tough, just as tough as many road races, but different entirely in driving technique.

Foreign cars had superchargers, big brakes, sturdy transmissions, formula fuel. Our fellows had no adequate brakes, few had superchargers, transmissions were inferior to the foreigners' and we used the fuel mixtures available for gasoline instead of the alcohol mixtures in foreign cars which gave a quicker and colder explosion and extra power.

Our drivers, with their cars, entered the 1936 Vanderbilt under a great disadvantage. They knew the great handicap they

(Continued to page 136A)

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EASILY, WITH FLEXARC
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ONLY \$123.50
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CORD SET
MONEY MAKER.**

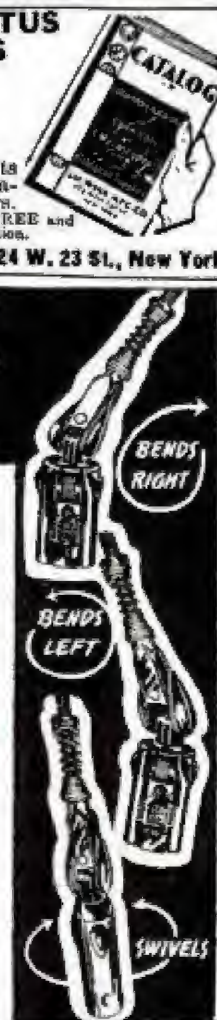
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(Continued from page 135A)

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INSTANTLY**



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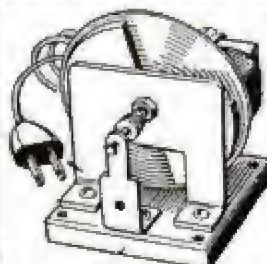
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were under, but they made up their minds that, beaten or not beaten, they would gain important experience—find out what conditions were and what they were up against. The first American to finish landed in sixth place but our boys drove a good race considering their equipment.

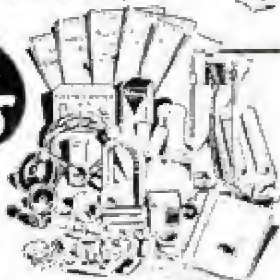
The 1937 Vanderbilt found the Americans better—but not fully—prepared. Some had foreign cars, others had built new cars. They had increased brake sizes, they had better transmissions, they had been experimenting with superchargers and fuel mixtures. And they made the best of what they had found out. Our drivers proved they could pilot cars in a road race. Rex Mays, who finished third in an old Alfa Romeo, outran two new Alfas and gave Seaman, the Britisher in a Mercedes, a swell run for second place. Seaman had a faster car and passed Mays on the straightaways—but Mays was passing. Seaman regularly in the turns. That's road driving!

In the past two races American drivers have proved that they've got what it takes to win road races. Give them cars that are right and they are going somewhere. One thing, however, the Europeans excel in is pit control and pit operations. That's something our drivers need and need badly. The foreigners have pit forces which are practical, military and automatic. When Rosemeyer, Germany's blond champion who won the 1937 race, stopped at the pits, each man did one job and one job only—and he did it with military precision. As a result, Rosemeyer was out in forty-six seconds after refueling and changing right and left rear tires. Some of our men spent too long in the pits. The records show an American car stopped six minutes for fuel only!

When you are running five seconds apart, pit stops make or break you. In the 1937 race, Rosemeyer beat Seaman by fifty-one seconds. If Rosemeyer's pit work had not been phenomenal—if he had spent a minute and forty-six seconds in the pit instead of forty-six seconds—it is conceivable, even probable, that Seaman would have won.

Over here we do not give enough serious consideration to pit operations. Some of our fellows come down to the track, ap-

(Continued to page 139A)

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Dozens Experiments—Run up thief detector, electric alarm, electric welder, radio code set, electroplating, arc furnace, circuit tester, rectifier, 110-volt motor, arc light, 5,000-lb. range, secret service phone, generate sun tan health rays, make electric stove, etc.

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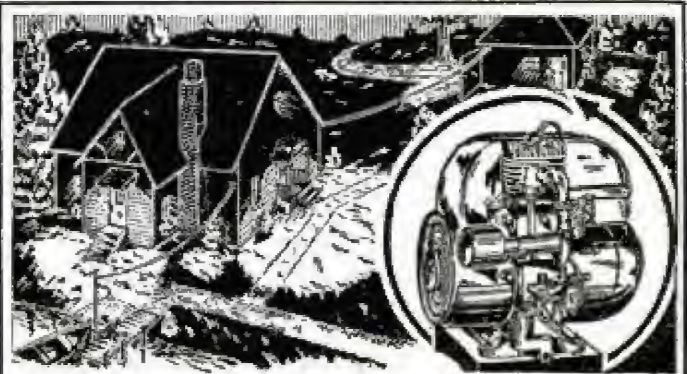
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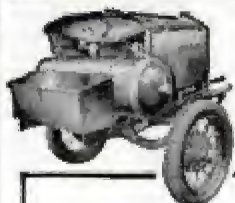
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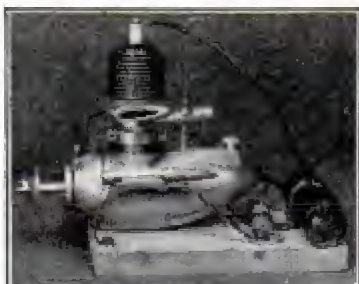
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(Continued from page 138A)

point one well-wisher to take care of tires and some other man, with good intentions, to refuel. The first inkling the tire man has of his duties is when the car rolls into the pits. Then all is confusion and precious seconds are wasted. Efficient pit control doesn't cost so much but it helps win a great many races.

I am not afraid of how American drivers will fare against foreign competition if they have comparable equipment. Despite lack of finances—for he usually bears the entire expense of his racing—the American driver produces astonishing results, results often comparable to those of European drivers who usually are on regular salaries and whose cars are engineered and maintained by the manufacturers abroad. It would help a great deal if our manufacturers would give our drivers a greater measure of support in their problems.

The engineering ability developed by many of our leading drivers has been the wonder of the automobile industry and this experience, coupled with a highly developed driving ability, has placed them on a competitive basis with the leading drivers of the world. Given cars of equal performance and reliability, American drivers will come into their own in international competition and place the American automobile industry where it should be in racing—at the top.

And, it seems to me, the American automobile industry owes more to racing than it has contributed to it in the past decade. Except for racing, we might never have had demountable rims. Superchargers, high-speed motors, aluminum alloys, efficient brakes, new types of carburetion and new tire formulas, all were born on the race track. A dozen other developments have been lifted off racing cars and applied to commercial cars.

Many future developments may be expected to come from racing—more, perhaps, than racing has contributed in the past. Only by contributing its own share of research and experiment can our own automotive industry reap its shares of the reward from these future developments. And the laboratory for this research and experiment is—as it has always been since the first horseless carriage frightened the first horse—the race track.

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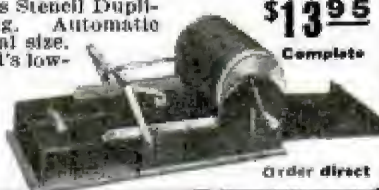
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THE TURNER BRASS WORKS
Sycamore, Ill. U.S.A.

Dispatching the Corn Poppers

(Continued from page 85)

side in the middle and the same for the left and right rear. Thus, in a glance the lighting requirements for eight states can be shown.

Transportation companies have learned through experience that good maintenance is an important factor in safe driving. So while his trailer is being loaded, the driver checks every point of his "horse" carefully. When the unit is ready to leave the terminal, it is rechecked by supervisors. This completed, he is given a chart to sign and is on his way. On the highway, the driver is expected to observe all regulations, and some of the larger companies employ cruising cars to see that he does. Habitual offenders are penalized.

The big companies have facilities for keeping tab on the movements of their trucks. By means of a contract telephone wire out of Chicago, Dispatcher Mason checks with Keeshin's northern terminals at Eau Claire, Madison, Milwaukee, Minneapolis and St. Paul each night between 8:30 and 9:00 in order to get a report on the incoming transports and to advise the dispatchers at these points of the trailers headed for their terminals. A half hour later, South Bend, Detroit, Cleveland and Toledo are contacted. He then calls the western division—Sterling, Peoria, Bloomington, Decatur, Springfield and Indianapolis. Direct calls to Fort Wayne and Indianapolis complete his routine.

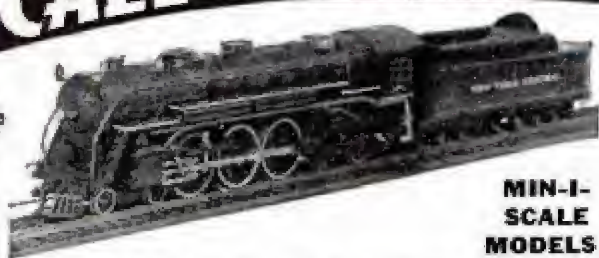
Special stops along the route are designated as registering depots. If a truck is delayed, the driver must report to the nearest dispatcher.

The unpardonable sin of the highway is to fall asleep at the wheel. No driver likes to think about it but occasionally it happens with unusual, sometimes tragic results.

What does a driver think about while he's on the road? Asked that question, one driver looked over his instrument board with its tachometer; air, fuel-oil, heat and pressure gauges; two ammeters, speedometer; levers to control engine heat; air brakes, levers for controlling the three sets of gears in the transmission, which make possible twelve forward and three reverse speeds, and then replied: "Nothing, except what a whale of a responsibility it is to drive one of these corn-poppers!"

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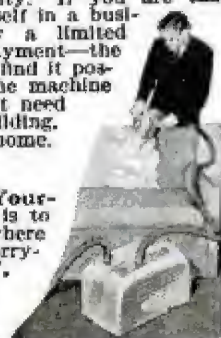
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Red and Black Magic

(Continued from page 45)

Perhaps he thought of the nine and pointed to five. Then he would, mentally, call the five spot nine, the four spot ten, the three spot eleven, the deuce twelve, the ace thirteen, the ten fourteen and his finger rests on the chosen nine when he counts—to himself, of course—fifteen.

Here is a fooler that takes in five of your crowd at once. Spread out a deck and let each of the five draw five cards, think of one of those five and then lay them face down in a separate pile in front of you. When each person has done this, pick up the five cards from the man at your left, then place the next five on top, and so on until you have the twenty-five cards in order in your hand. Then deal them out again face up in five rows horizontally. The first five cards you deal across the board will be the five chosen by the man at your right, the bottom horizontal row will be the five picked by the man at your left, etc. Ask the man at the right, for example, which vertical row contains the card he is thinking of. When he indicates the row, you can point to the card, for you know the top horizontal row is his.

One of the easiest stunts is to let one of the party pick a card from a deck and tell him you can discover it. While he is looking at his card, glance at the bottom card of the deck. When he replaces his card on top of the deck give it a false shuffle without disturbing top or bottom card. Then give the deck a simple cut. This brings the chosen card directly under the card you know was on the bottom. Then, feigning wizardry, thumb through the pack and dramatically produce the card.

There is another way of discovering two cards drawn by the audience. For this trick you use a prepared deck, privately separated into two parts—one half the red cards, the other half all black. Extend the halves in your hands and let two persons draw a card, one from each half. As they look at the cards you switch the cards in your hands unnoticed. When the two cards are returned they go into the wrong half deck—the red card is slipped into the black half, the black card into the reds. All you need do then is make a few mystic passes and thumb through the deck to pick out the misplaced red and black cards.

It's simple enough to you, but it's red and black magic to the fellows out in front!

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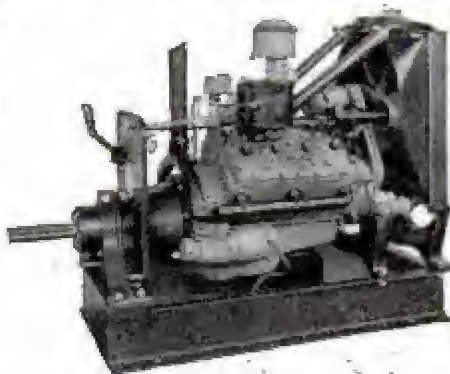
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Packing Drama in the Films

(Continued from page 75)

rider and horse from serious injury. Here again the camera travels faster than the horse for the effect of speedy action.

When the story called for a man to fight a man-killing shark in a recent South Sea island picture the studio property department sent an order to a rubber company to make them a shark. The rubber shark performed quite realistically in the studio tank.

You can't rehearse a complete movie wreck. It would be too costly and too dangerous. In B. P. Schulberg's film, "She Asked For It," a stunt man sends an expensive roadster plunging through a bridge railing. It ends up in a blazing mass of



Cameramen pull camera on track to film covered wagon moving along Old Chicago's streets

wreckage some thirty feet below. The script called for a big sedan to crowd the roadster through the wooden railing. The studio was prepared for anything to happen. A doctor was on hand, dozens of policemen kept curious onlookers off the road, a fire truck stood by and saved the wooden bridge that caught fire from the blazing machine and there was a wrecking truck. Director Erle Kenton coached his stunt men, Jack Woody and Billy Jones, just how and where they were to wreck the machine. The special effects department had explosives planted in the back of the machine so it would explode when it hit the canyon floor. Woody had to pull the explosion switch and jump onto the bridge the instant the machine left the

20.9.79
road. He received only minor scratches in performance of the stunt.

All glass is removed from the windows of automobiles you see wrecked on the screen. The bodies are reinforced with steel and there are steel supports placed under the hood. This keeps the body from collapsing. A fake license plate is used because people might sue the studio if the license was the same as theirs. Usually nearly all the gas is removed from the tank to avoid fire. A stunt man gets about \$150 for a movie wreck.

You would think that stunt men would pad their bodies heavily, but they don't. Safety belts are worn for a head-on collision, particularly if the car is to take a roll. Football helmets protect their heads. And they usually pad their shins, as the



This shark looks real, but it is made of rubber. Swimmer battled it in studio tank

feet always fly forward. One driver wears a mask of heavy Cellophane over his face.

Running wild, after the driver has jumped off, a large gasoline truck crashes into a store. On the screen, when you see the driver jump off, you never guess that a stunt driver is hidden on the truck. A black hood over his head and face and a black robe over his body keep the camera from photographing him. At all times he has the truck under control and the camera supplies the illusion of speed to make it melodramatic.

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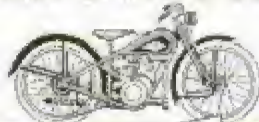


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Two Miles Down for Oil

(Continued from page 29)

ished and the casing set in place, a special oil-well gun is lowered into the hole opposite the formations and is fired electrically, its slugs penetrating through the casing and allowing oil to seep into the pipe.

One of the big troubles in the past was that drillers usually dug crooked holes. Some of them descend in corkscrew spirals while others wander off after they have gone down a few thousand feet. When a drilling tool cuts into slanting formations, some hard and some soft, the tool is often deflected to one side. In the last few years



Milling tools used for curving well to reach oil pool at one side of derrick site

drillers have learned to drill into new formations slowly in order to cut straighter holes, and they also have a wider variety of bits for the purpose. Drilling straight holes allows them to drill deeper. Also, drillers can deflect the drill pipe into regions far from directly under the derrick, a maneuver that enables them to needle into oil pools that lie off shore under the ocean or under improved property.

When a tool is lost in the hole or when the drill pipe breaks off far below the surface, the drilling crew has a "fishing" job

(Continued to page 149A)

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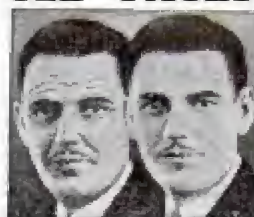
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(Continued from page 146A)

that may take weeks or months to finish. Usually the first thing to do is to run a soft lead plug down the hole to get an imprint so the driller may know "what's looking up at him." Wall hooks, automatic clamps, grappling devices and even especially shaped tools for the particular job are lowered into the hole to fish for the lost part. Sometimes when a broken pipe becomes stuck far below, a cutting tool is lowered down inside of it. A long section of the pipe is cut off and brought up, then another long section, until the rest of the pipe becomes free.

Even though oil men are able to penetrate twice as far into the earth as they could in the past there is no wild rush toward deep drilling, mainly because oil that is recovered from such depths is pretty expensive. It costs something like a third of a million dollars to dig such a hole, with no certainty that oil will be found at the bottom. Aside from exploration, deep drilling is being used mainly to extend the depth of existing wells after the oil sands they have been tapping become exhausted.

One thing that has temporarily suspended the need for drilling deeper is the new process of acidizing by which existing wells are made to increase their flow. Acidizing also helps to "bring in" new wells. Such a treatment consists of pouring thousands of gallons of inhibitive acids down the well, where it washes away drilling mud that clings to the walls and opens up the pores of the rock in the vicinity of the hole, permitting oil to flow into the well more easily.

Today 92.5 of the oil produced in the United States is coming from depths of between 1,000 and 7,000 feet, of which the section between 3,000 and 4,000 feet is the most prolific. Only three or four per cent of production is coming from below 7,000 feet, although very deep production is considered extremely important because of its future possibilities.

"No one knows how far down into the earth oil will be found," says H. J. Steiny, Associated geologist. "The chances are that productive zones will be found down to depths of 20,000 feet. There would be nothing startling or out of the ordinary about a four-mile-deep well, aside from its price. Such a hole would cost at least half a million dollars."

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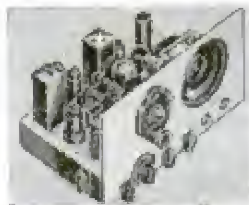
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Beam-Power Four-Tube Midget

(Continued from page 99)

their relative positions. The variable condenser, speaker and other parts mounted on top of the base are sketched in above so that all connecting wires are clearly shown. All wiring is done with No. 16 stranded



FIG. 2-D

hookup wire with push-back insulation. It will be noted that a length of No. 14 tinned-copper bus-bar wire is used for common ground connections. This is a handy and efficient way to insure well-soldered grounds to the metal base. Rosin-core solder is employed for all connections. The schematic circuit diagram is given in Fig. 3. A list of the original parts used can be obtained from Popular Mechanics radio de-

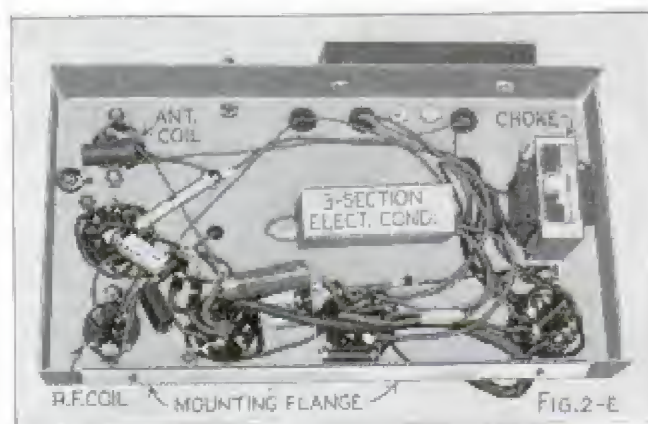


FIG. 2-E

partment without charge. The blueprint number is R-247.

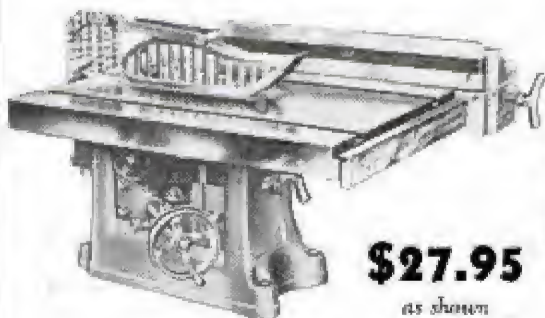
Photos Figs. 2-A, 2-B and 2-C show various top and front views of the completed set; photos 2-A and 2-D illustrate the method employed in mounting the receiver on a plywood front panel of any required

(Continued to page 152A)

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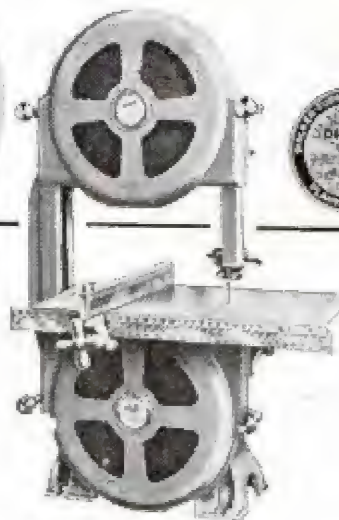
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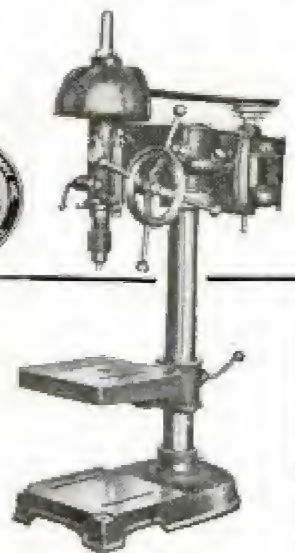


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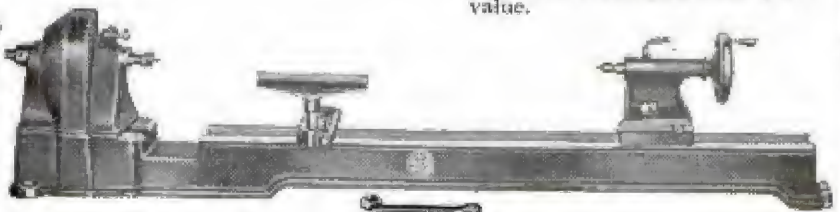


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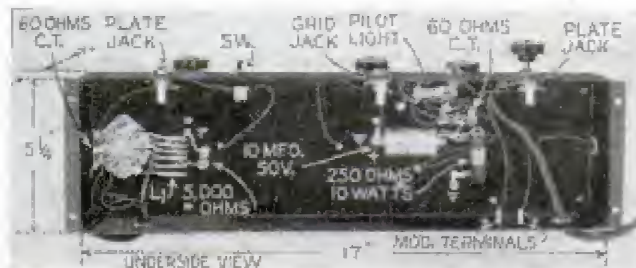
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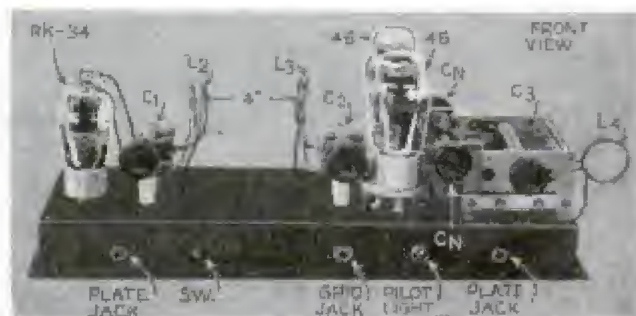
Simple 5-Meter Transmitter for Beginners

(Continued from page 100)

possible. The metal base is 17 in. long, 5½ in. wide and 2 in. high. Both neutralizing condensers (CN) are mounted on rectangular pieces of Victron, which are fas-

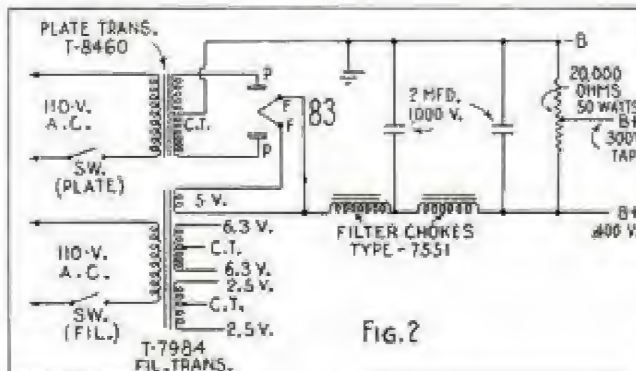


tened directly on the side of the National plate tuning condenser (C₃). This gives a compact arrangement with short, direct leads. A list of the original parts used, together with complete tuning and operating instructions, can be obtained from

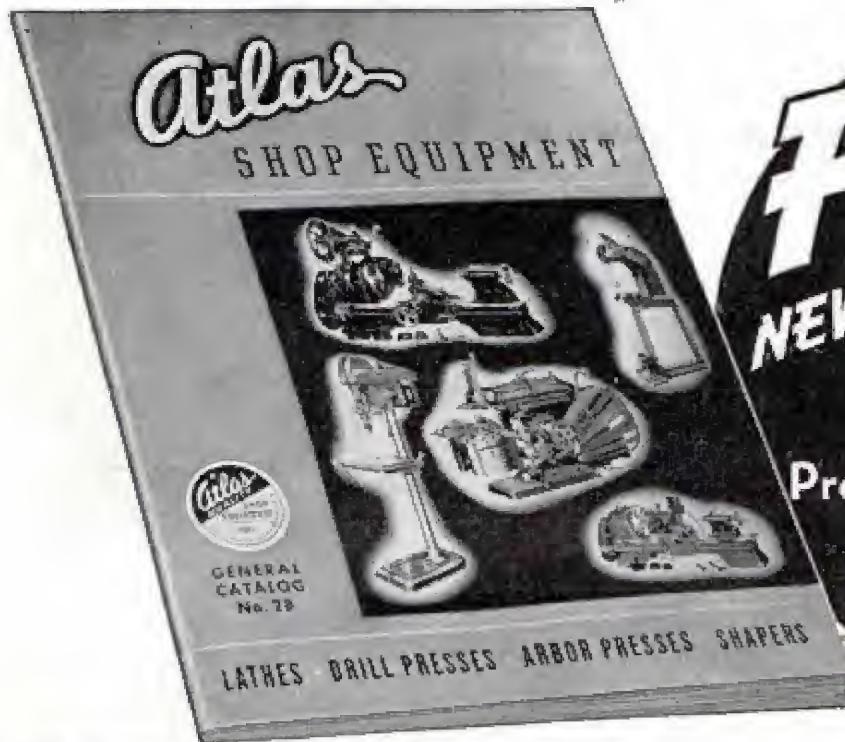


Popular Mechanics radio department, without charge. The blueprint number is R-248.

If carefully adjusted, this transmitter has a frequency modulation of around 20 kilocycles at 100 per cent modulation and



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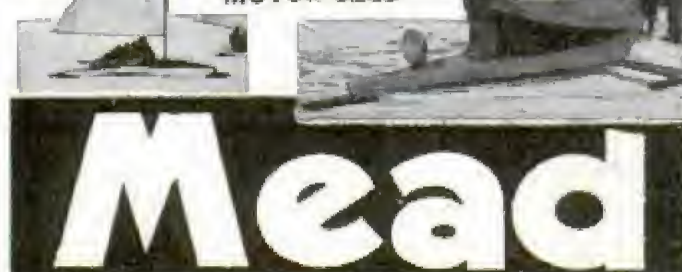
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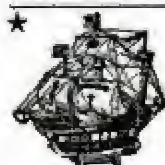


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Putting the World on Skids

(Continued from page 61)

ta which was held at Fox Lake, Ill., in 1936, had thirty-eight "Skeeters" start. Melvin Jones and Ted Meade took first and second places. The biggest event in the middle west is the regatta held each year in Wisconsin by the North American Ice Yachting Association, which attracts hundreds of boats of all types.

The rules for ice-yacht racing are very similar to those of the International Yacht Racing Association, with a few modifications. The iceboats are lined up at the start, an equal number on each side of the starting mark. When the gun cracks, they start off on opposite tacks, with the crews



Those who have tried it say there's nothing like an iceboat for a real thrill

pushing the boats to get them under way. If there is no wind it is entirely permissible to push a boat all the way around the course. You can get out at any time it seems advisable and give it a shove. The boat on starboard tack has the right of way over the boat on port tack. The boat going down wind must keep clear of the boat going up wind. The windward boat must keep clear when two boats converge on the same tack. Starboard tack means that you are sailing with the wind coming over the right hand, or starboard side of the bow. Port tack, the wind is coming over the left or port side.

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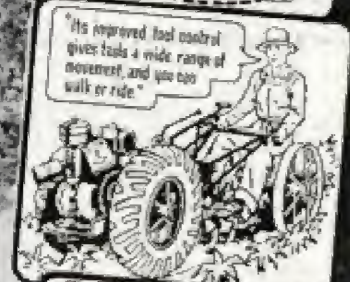
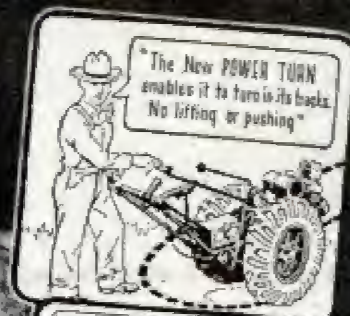
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20115

New Wealth from the Sea

(Continued from page 3)

in with finer seines, usually operated from vessels of from fifty to 100 tons and crews of from ten to fifteen men.

The various types of fishing vessels feature a great number of new mechanical accessories such as electric hoists and draw lines which do much of the work done formerly by manpower. All hatches are loaded with chipped ice or refrigerator coils, and the catch is instantly "put on ice."

There are now about 2,700 fishing vessels in operation off U. S. shores and more than 17,000 smaller boats. The more modern fishing boats are heavier crafts costing from \$100,000 to \$250,000 each.

Heretofore more than fifty per cent of the live weight of sea fish has been wasted. The modern fishing plant seeks to make more use of by-products. For this reason fish packing is now one of the most rapid manufactures known. The fish are weighed and run through an automatic scaler, then delivered by endless-chain carriers to expert butchers who cut off the fillets or side meat. Fillets are then wrapped in Cellophane, packed in paper cases, and frozen at sub-zero temperatures, to remain frozen until they reach the frying pan.

The remainder of the fish, about sixty per cent of original weight, is then dispatched for by-products. In some instances the bone is extracted to be ground into bone meal. Livers are extracted, cooked, and placed in power presses where the oil is taken from them. The rest of the fish is cooked for glue. The dry portion of the waste is re-cooked and ground into meal, an important feed for livestock.

Sea-food canning is now a \$100,000,000-a-year industry. Salmon remains the most important canned sea product with tuna second. The Alaska salmon pack alone returns to the United States about \$40,000,000 a year. Perhaps the most promising of all the new uses for fish is that of fertilizers. The material is rich in phosphorus and potassium.

From kelps or seaweeds modern industry is making iodine, dyes, anti-rust solutions, spray materials, imitation hemp, and composition roofing. One of the most bizarre of the new ocean products is manufacture of artificial pearls and other imitation gems from herring scales.

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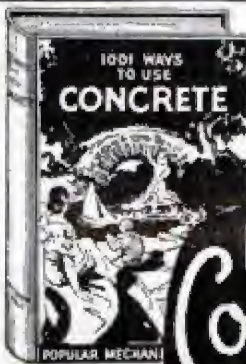


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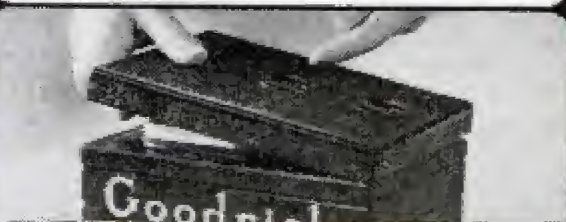
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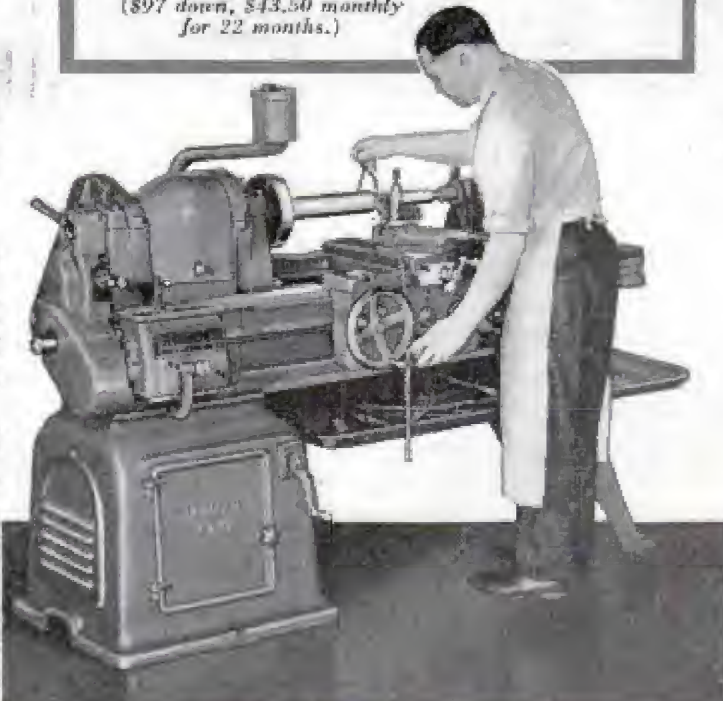
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SOUTH BEND Precision LATHES



Get **MOBIL OIL ARCTIC**—For 30 winters
Millions of Motorists have proved it's America's

BEST



WINTER OIL

WINTER-PROOF TODAY

START QUICK with Mobiloil Arctic—world's largest-selling winter oil.

SHIFT EASY with Mobiloil Gear Oil. No more fighting with your gears.

RIDE QUIET. Winter Mobilgreases end nerve-racking squeaks.

PREVENT FREEZE-UPS. Protect radiator with Mobil Freezone.

"BETTER ONE WEEK EARLY...THAN ONE DAY LATE!"

TIME: 8 a.m.! TEMPERATURE: Freezing!
TOUCH THE STARTER...and YOU'RE OFF!

Mobiloil Arctic starts cars quick...easy!
Gives double protection—when your motor's cold or running hot. That's why...

More people buy Mobiloil Arctic than any other winter oil in the world!

Isn't that a great testimonial? It's the finest proof you could ask—that Mobiloil Arctic is the oil for your car this winter!

MOBIL OIL AND MOBIL GAS

SOCONY-VACUUM OIL COMPANY, INC.





Joan Crawford

takes time out from her part in M-G-M's "Mannequin" to play the part of Mrs. Santa Claus. Joan Crawford has smoked Luckies for eight years, has been kind enough to tell us: "They always stay on good terms with my throat."

TobaccoLand's Finest Gift

When you offer friends the welcome gift of cigarettes, remember two facts:

1. Among independent tobacco men, Luckies have twice as many exclusive smokers as all other brands combined.
2. Luckies not only offer you the finest tobacco but also the throat protection of the process "It's Toasted".

With men who know tobacco best...

It's Luckies 2 to 1

January 1938
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